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TRACE TRAJECTORY ANALYSIS AND ORBIT DETERMINATION PROGRAM. VOLUME VII. USER'S GUIDE, PART B: APPENDICES (REISSUE B)

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20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

The TRACE Trajectory Analysis and Orbit Determination Program is a general-purpose orbital analysis program. It was written and continues to be developed specifically to assist technical personnel in the analysis and design of satellite orbits and tracking systems. Volume VII is intended to serve as in input usage guide that defines all input required to perform TRACE functions such as trajectory generation, data/observation generation, orbit determination, and statistical analysis. A comprehensive

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description for each specific input item is given, and input data structures are shown. The Usage Guide is published in two parts, A and B.

The TRACE documentation series is summarized as follows:

Volume I:	General Program Objectives, Description, and Summary
Volume II:	Coordinate and Timekeeping Systems with Associated Transformations
Volume III:	Trajectory Generation Equations and Methods
Volume IV:	Measurement Data Generation and Observational Measurement Partials
Volume V:	Differential Correction Procedure and Techniques
Volume VI:	Orbital Statistics via Covariance Analysis
Volume VII:	Usage Guide, Parts A and B
Volume VIII:	Not to be published
Volume IX:	Detailed Program Structure
Volume X:	Lunar Gravity Analysis
Volume XI:	LGA Data Processor
Volume XII:	Sequential Least Squares Procedures and Techniques

PREFACE

Certain volumes of the TRACE documentation series were published by The Aerospace Corporation as Technical Operating Reports. Volume III: Trajectory Generation Equations and Methods was published as TOR-0066(9320)-2, Vol. III, and Volume V: Differential Correction Procedure and Techniques was published as TOR-0066(9320)-2, Vol. V.

Volume I: General Program Objectives, Description, and Summary was published as TR-0059(9320)-1, Vol. I, and Volume X: Lunar Gravity Analysis was published as TR-0059(9320)-1, Vol. X. Future volumes in this series will be published as Technical Reports.

This report is published in two parts, A and B.

The TRACE Program could not have been developed to its present status without the assistance of many people working in the fields of astrodynamics and software design. The authors acknowledge with gratitude and analysis and/or programming efforts of A. B. Bierman, R. J. Farrar, W. A. Feess, E. H. Fletcher, R. B. Freund, T. P. Gabbard, C. G. Gibson, P. T. Gray, P. T. Guttman, J. A. Pearson, C. M. Price, W. F. Rearick, N. W. Rhodus, A. J. Rusick, L. J. Tedeschi, L. Wong, and K. R. Young. In addition, consultations with W. T. Kyner, A. Troesch, and H. H. Wertz have led to many significant improvements and added capabilities in the program.

This report supersedes the appendices to TR-0059(9320)-1, Vol. VII, 30 June 1971. NR at DDC

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DESCRIPTION OF THE GENERAL-PURPOSE INPUT ROUTINE GAIL1

A.1 FUNCTION AND CAPABILITIES

A.1.1 Purpose and Description

The purpose of GAIL1* is to read a set of Hollerith punched data and/or header cards into core with one FORTRAN call statement. To achieve this, the data fields are converted to binary, while the header information is stored in Hollerith code; each piece of the data is converted and stored according to a specific conversion code. These data may be integers, real variables, arrays, alphanumeric data (short or long headers), matrices, or end-of-case indications.

The data cards can be printed as received, or they can be placed on a scratch I/O device and then listed when an end of file (EOF) is detected on the input file.

The subroutine will always return control to the driver program except in the case of tape errors, system malfunctions, or completely erroneous punched data cards that disobey all FORTRAN I/O format rules. Therefore, the user must supply and test a status cell after an exit from the subroutine to determine which of the following occurred:

- Normal end of case
- Some type of error
- End of file reached on the input device

---

*GAIL1 was originally developed by R. B. Gladson of The Aerospace Corporation for the CDC 6000 computer series. It has been modified for IBM 360 and 370 computer series.

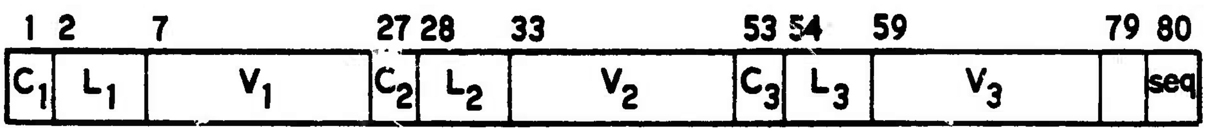
A. 1.2 Method

All data fields are converted according to FORTRAN I/O format specifications. Real variables are converted by the F specification, whether or not the exponent (E or D) is included with the variable. Integers are converted by the I format, and alphanumeric data by the A format. This allows for alternate methods of entering real variables and integers from the FORTRAN standards. This variety of methods (Sec. A. 1.3.7) enables the user to enter numbers in a manner more reasonable and mathematical than did previous input routines.

A. 1.3 Usage

A. 1.3.1 Data Card Format

The data card format consists of three fields, each containing three subfields; a conversion code; a location; and a value (as in the following example):



Subfield	Data Field 1	Data Field 2	Data Field 3
Conversion Code (C_i)	1	27	53
Location (L_i)	2-6	28-32	54-58
Value (V_i)	7-26	33-52	59-78

Columns 79 and 80 are not processed by the routine and can be used for card sequencing if the user desires. The conversion code (C_i) is one of the alphabetic characters (Sec. A. 1.3.7); it specifies the type of conversion to be used on the value field. The location subfield specifies the cell in which the converted value subfield is to be stored.

A.1.3.2 Header Card Format

The header card format consists of a conversion code in Column 1, a sequence number in Columns 2 through 6, and any Hollerith information in Columns 7 through 78. Columns 79 and 80 are not used.

1	2	7	79	80
C	L	Header		seq

A.1.3.3 Decimal Points

The use of a decimal point is valid in both integer and real variable entries; however, it is not mandatory to enter one. If the decimal point is missing from an entry, it is assumed to be at the right of the last digit punched in the value field; for example:

321. = 321 = 321E0

A.1.3.4 Signs

If signs (+ or -) are used, they are placed in a column by themselves and immediately precede the value. Overpunches are not valid; e.g.:

1 27 53	2 28 54	7 33 59
C	LOCATION	VALUE
		+7.1621

Valid

1 27 53	2 28 54	7 33 59
C	LOCATION	VALUE
		7.1621

Invalid

A.1.3.5 Values (V_i Subfield)

It is not necessary for the entire subfield to be filled, since the first blank following the first nonblank denotes the end of the value. Superfluous low-order zeros should be omitted.

If alphanumeric information is entered, it is stored in core as it appears in the value subfield. Thus, for this type of data entry, leading blanks are retained. If they appear, the blanks themselves are also stored in core.

A.1.3.6 Location (L_i Subfield)

The location is specified by either a variable, an array name, or the element subscripts in a single-dimension array or matrix.

A.1.3.6.1 Variable, Array, or Matrix Name

If the location contains at least one nonnumeric character that is not a comma as the third character, it is interpreted as a variable, array, or matrix name. The contents of the value subfield are stored in the cell for the variable or in the first cell of the array or matrix. This location then becomes the origin of all numeric and matrix element locations that follow until another variable, array, or matrix name is encountered. Care must be taken to enter an array or matrix name before entering numeric or matrix element locations.

A. 1. 3. 6. 2 Single Numeric Entry

If a location contains a single numeric value, the entry is treated as a subscript. With its previously established origin, this subscript is used to compute the location in which the entry in the value subfield is stored. For instance, if the established origin is NAME and the value in the location subfield of the input is 6, the entry in the value subfield is stored in cell NAME(6). (Single numeric entries must be left-justified, and leading zeros are optional.) In the following example,

1 27 53	2 28 54	7 33 59
C	LOCATION	VALUE
	NAME	3.716
	6	6.173

legitimate numeric entries would be shown as:

1 27 53	2 28 54	7 33 59
C	LOCATION	VALUE
	5	
	12	
	03	

and illegitimate numeric entries would be shown as:

1 27 53	2 28 54	7 33 59	
C	LOCATION	VALUE	
	1		- Not a valid subscript.
	30① 1		- Store as 30.
	① 1		- Not recognized as a relative address; it is flagged as an error.

The symbol ① indicates 1 space between digits, and ⓝ indicates n spaces.

A.1.3.6.3 Matrix Element Entry

A matrix element is stored by specifying two separate two-digit numeric entries, separated by a comma, in the location subfield. For example:

1 27 53	2 28 54	7 33 59
C	LOCATION	VALUE
	03,04	-3.17

-3.17 goes to element (3,4) of the matrix

1 27 53	2 28 54	7 33 59
C	LOCATION	VALUE
	15,01	+7.38

+7.38 goes to element (15,1) of the matrix

The elements are stored in the column major sort by using the formula

$$ØRIGIN\left((j - 1)I + i\right)$$

where I is the total number of rows in the matrix and (i, j) is the element in question.

A.1.3.6.4 Blank Location

If the location is left blank, the entry in the value subfield is stored in the cell immediately following the one in which the last value was stored. Thus, an entire array may be entered by using a name in the location subfield for the initial entry and leaving location subfields blank for the subsequent value subfield entries. The following is an example:

1 27 53	2 28 54	7 33 59
C	LOCATION	VALUE
	XYZ	4.0
		5.1
		6.2

4.0 stored in XYZ(1)
5.1 stored in XYZ(2)
6.2 stored in XYZ(3)

A. 1.3.7 Conversion Code (C_i Subfield)

The entry in the conversion code subfield specifies the method of converting the data in the value subfield. Care should be taken to apply the proper code with each item of data; if the proper code is not applied, a premature termination will occur in a FORTRAN format statement. The eight conversion codes currently available are described in the following subsections.

A. 1.3.7.1 Blank: Real Variable

The number in the value subfield is converted to and stored as a real variable. Entries can be made to the value subfield by any of four methods: Three of them are in the normal FORTRAN E, D, and F types of real variable input formats, e.g.:

1 27 53	2 28 54	7 33 59	
C	LOCATION	VALUE	
		3.615	= 3.615
		.3615E01	= 3.615
		3615E-03	= 3.615
		3615D-03	= 3.615
		.3615D01	= 3.615

The fourth method allows for the input of real variables in scientific nomenclature ($a \times 10^b$). The number is written in the value subfield and is followed by an X, then by a 10, and then by the power of ten to which the number is to be scaled (a sign must precede the exponent). Some examples follow:

- $14200 = 1.4200 \times 10^4$ is input as

1 27 53	2 28 54	7 33 59
C	LOCATION	VALUE
		1.4200X10+4

or, in the normal mode, as

1 27 53	2 28 54	7 33 59
C	LOCATION	VALUE
		14200

or as

1 27 53	2 28 54	7 33 59
C	LOCATION	VALUE
		1.4200E4

- $.00762 = .762 \times 10^{-2}$ is input as

1 27 53	2 28 54	7 33 59
C	LOCATION	VALUE
		.762X10-2

A. 1.3.7.2 I: Integer

The number in the value subfield is converted to a fixed-point integer. A decimal point is allowable; if it is used, only the integer portion is converted. Before the value is converted by the FORTRAN I format, the decimal point and any digit(s) to the right are stripped off; e.g.:

1 27 53	2 28 54	7 33 59
C	LOCATION	VALUE
I		71.35

is stored as 71.

A. 1.3.7.3 D: Short Header (20 Characters)

The contents of the value subfield are interpreted as 20 alphanumeric characters. They are stored in two consecutive cells in ascending order, beginning at the location specified by the location subfield. The characters are stored in the same relative positions as in the value subfield; thus, leading, trailing, and embedded blanks are legitimate. For example:

1 27 53	2 28 54	7 33 59
C	LOCATION	VALUE
D		ABC①DEF②GHIJ④234

is stored in two consecutive words, with ABC①DEF②G in the first word, and HIJ④234 in the second.

A. 1.3.7.4 H: Long Header (72 Characters)

A card with an H in Column 1 is considered a long header card. If the location subfield is blank, the card is ignored (treated as a comments card). If the location subfield contains a left-justified integer 1, Columns 7 through 78 of the card are stored directly in seven consecutive words in ascending core storage.

The H conversion code is the only one for which a numeric location subfield is mandatory. If the location subfield is not blank or the integer 1, the header is not stored, an error comment is printed, and the error termination procedure is invoked.

A.1.3.7.5 L: Sparse Matrix Input Definition

This input specifies only that matrix elements may be following, either on the same and/or on subsequent cards. It does not store any items of data; it only warns the subroutine that matrix elements might be stored and indicates where. The location subfield must contain the name of the matrix in which the items are to be located in core.

The value subfield must contain two-digit integers separated by a comma. The entries are the size of the matrix [I_{max} and J_{max}], and the comma must be the third character of the subfield. If it is not, an error comment is printed, and an error flag set.

The I_{max} and J_{max} values are retained to compute the successive subscripted locations of the matrix elements until they are redefined. Blank location subfields may follow this definition if successive elements of the matrix are to be loaded. It must be remembered that the matrix is stored in column major. For example:

1 27 53	2 28 54	7 33 59
C	LOCATION	VALUE
L	GØØD	03,07

indicates that a 3 × 7 matrix GØØD is being defined and that following data values are to be stored in GØØD until another symbolic location name is encountered. Storage is to be made according to GØØD $\left((j - 1)I + i\right)$.

A. 1.3.7.6 M: Full Matrix Input Definition

The use of this conversion code is identical to that of L, except that the entire matrix is preset to zero before any of the elements are loaded. For example:

1 27 53	2 28 54	7 33 59
C	LOCATION	VALUE
M	GØØD	03,07

presets the 3 × 7 matrix GØØD to zero; it is prepared to store the matrix elements following it until another symbolic location name is encountered.

A. 1.3.7.7 B: Octal

The value subfield is converted as a logical word. It is not necessary to include leading zeros, but the first octal digit must always occupy the left-most position in the subfield. If fewer than 20 digits are input, the value will be right-justified in the memory location. For example:

1 27 53	2 28 54	7 33 59
C	LOCATION	VALUE
B		123

is stored as 00000000000000000123_8 in core.

A. 1.3.7.8 E: End of Case

This defines the end of case, when control is returned to the object program from which it was called. The rest of the subfield and the remaining fields on the card are ignored.

A. 2 ERROR COMMENTS

The input errors that the subroutine can recognize are listed in Table A-1. In each case, an appropriate error comment is printed, the remaining cards in the data set are scanned until an E conversion code is found, and the run is terminated. The errors are not listed in any specific order.

Table A-1. Errors Recognizable by Input Subroutine

Error Message	Type of Input Error
HEADER CARD NO. EXCEEDS MAXIMUM NO. ALLOWABLE.	If the location subfield is not blank or the integer 1, the card is not stored; it is printed as shown, and the error termination procedure takes over.
← Card Image (80 Characters) →	
ERROR ATTEMPTING TO COMPUTE NEXT STORAGE LOCATION FROM BLANK LOCATION FIELD. BASIC SYMBOLIC ORIGIN HAS NOT BEEN SET.	The first value input had a blank location subfield, and no symbolic origin had been established.
← Field in Error →	
ERROR ATTEMPTING TO COMPUTE NEXT STORAGE LOCATION FOR A MATRIX ELEMENT. BASIC SYMBOLIC ORIGIN HAS NOT BEEN SET.	A matrix element is to be stored, but no location definition of the matrix has been made by a previous M or L card.
← Field in Error →	
MATRIX SIZE UNDEFINED.	A matrix element is to be stored, but no size definition of the matrix has been made by a previous M or L card.
← Field in Error →	
ERROR ATTEMPTING TO COMPUTE NEXT STORAGE LOCATION FOR NUMERIC LOCATION FIELD. BASIC SYMBOLIC ORIGIN HAS NOT BEEN SET.	The first value input had a numeric location subfield. No symbolic origin had been established before this point.
← Field in Error →	
UNDEFINED SYMBOL USED IN LOCATION FIELD.	A symbol not previously defined was used in the location subfield.
← Field in Error →	
MISSING COMMA IN MATRIX DEFINITION.	During an attempt to define a matrix (M or L conversion code), the third character in the value subfield was not a comma.
← Field in Error →	
ILLEGAL CONVERSION CODE.	An undefined conversion code was entered.
← Field in Error →	
INVALID CHARACTER IN VALUE FIELD.	There is an invalid character in the value field.
← Field in Error →	

A.3 SAMPLE GAIL1 INPUT FORM

A sample GAIL1 input form is shown below.

6600 INPUT DATA

PROGRAMMER __________ KEYPUNCHED __________ VERIFIED __________ DATE __________ PAGE ____ OF ____

1	2	7	77

	1 27 5.	2 28 54	7 33 59		1 27 53	2 28 54	7 33 59
SYMBOL	C	LOCATION	VALUE	SYMBOL	C	LOCATION	VALUE

AEROSPACE FORM 3770 REV 5-67

B. TRACE DATA DECK STRUCTURE EXAMPLES

FIGURES

APPENDIX B

TRACE DATA DECK STRUCTURE EXAMPLES

B.1 ORBIT DETERMINATION RUN (ITIN=2)

B.1.1 Single-Vehicle with OBSERVATION Card Input

The deck setup for an orbit determination run for one vehicle is shown in Fig. B-1. All observational measurements are input in the OBSERVATION block.

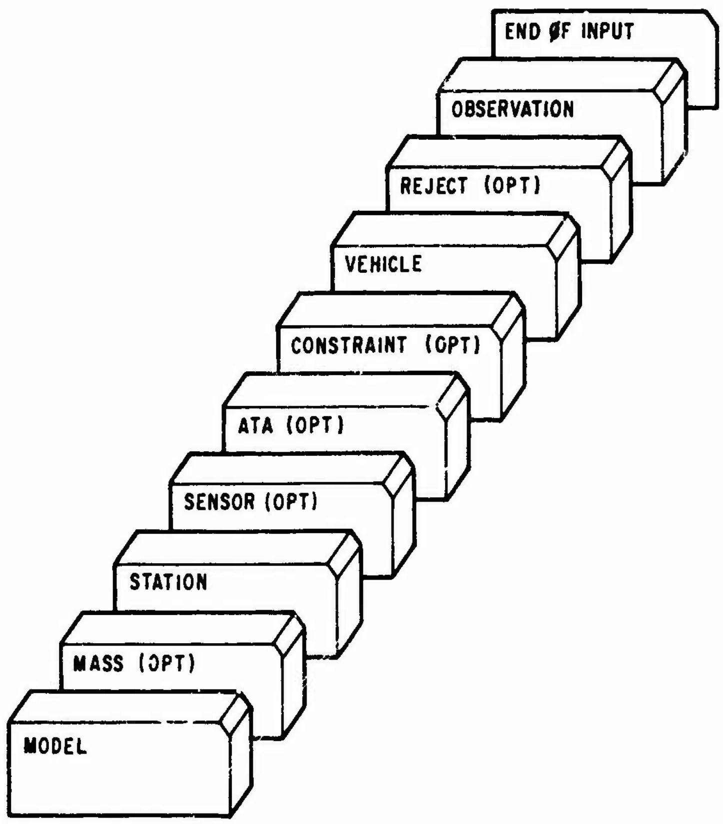


Fig. B-1. Deck Setup for a Single-Vehicle Orbit Determination Run with OBSERVATION Card Input

B.1.2 Multiple-Arc with OBSERVATION Card Input

The deck setup for an orbit determination of more than one vehicle in which measurements from the many vehicles are used (but each observation is associated with only one vehicle) is shown in Fig. B-2. In this case, only one model group (MODEL, MASS, STATION, SENSOR, ATA, and CONSTRAINT data blocks) is input; it is followed by the VEHICLE blocks for all vehicles, and then by pairs of REJECT and OBSERVATION blocks for each vehicle.

Each OBSERVATION card should have a vehicle number (Sec. 15), and VEHID and BTIME are required in each VEHICLE block. For convenience, in the VEHICLE block, the input data not overridden carries over from one vehicle to the next (characteristic of GAIL1 input).

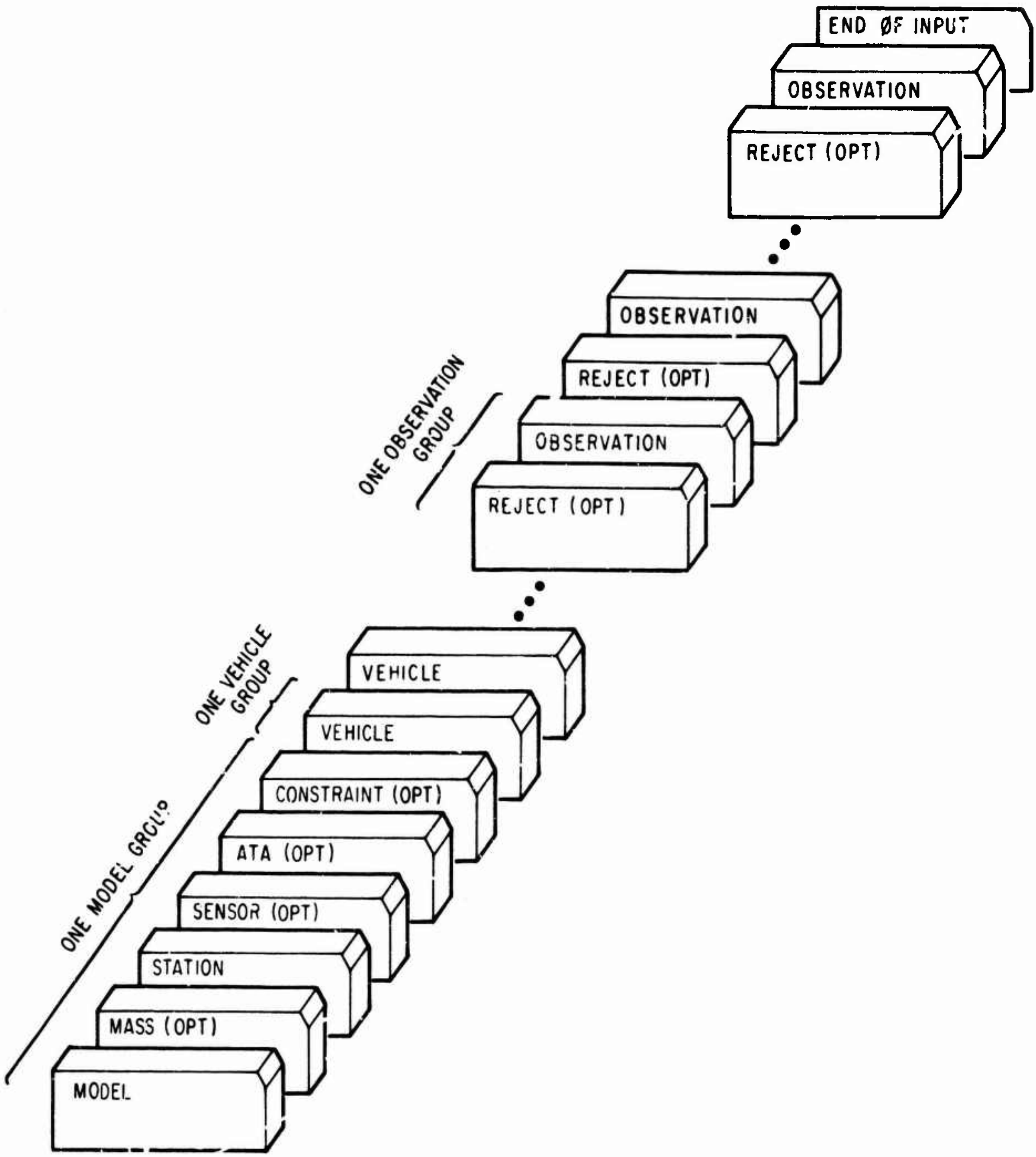


Fig. B-2. Deck Setup for a Multiple-Arc Orbit Determination Run with OBSERVATION Card Input

B.1.3 Single-Vehicle with Card Image Observation File Input

The deck setup for an orbit determination run for one vehicle, using observational measurements found on a card image observation file (TAPE4) is shown in Fig. B-3. This setup is indicated by the input item BCDIN≠0 (Sec. 11.2.1) in the VEHICLE data block and the fact that the OBSERVATION card is followed by the END ØF INPUT card.

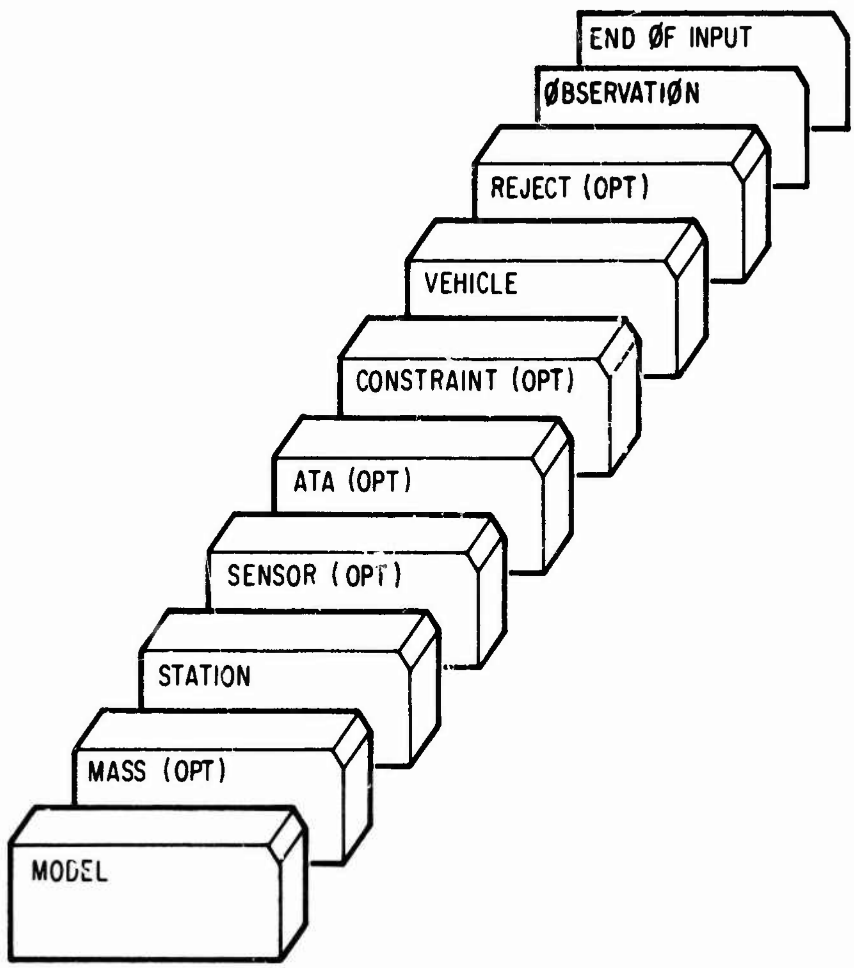


Fig. B-3. Deck Setup for a Single-Vehicle Orbit Determination Run with Card Image Observation File Input

B.1.4 Multiple-Arc with Card Image Observation File Input

In an orbit determination run with observational measurements from several vehicles (each item of data is associated with only one vehicle), the data deck requires only one set of model group data blocks (Fig. B-4). For each vehicle there must be a VEHICLE block followed by the pairs of REJECT and OBSERVATION blocks.

In the VEHICLE block, input data not overridden will carry over from one vehicle to the next. BTIME is required in each VEHICLE block to show the last integration time (more than likely, the last observation time). VEHID, which should match the vehicle number on the observation card images for that vehicle, is also required.

For this case, observations are input by the card image observation file (TAPE4). This is indicated by BCDIN≠0 (Sec. 11.2.1) and by a single ØBSERVATIØN card for each vehicle.

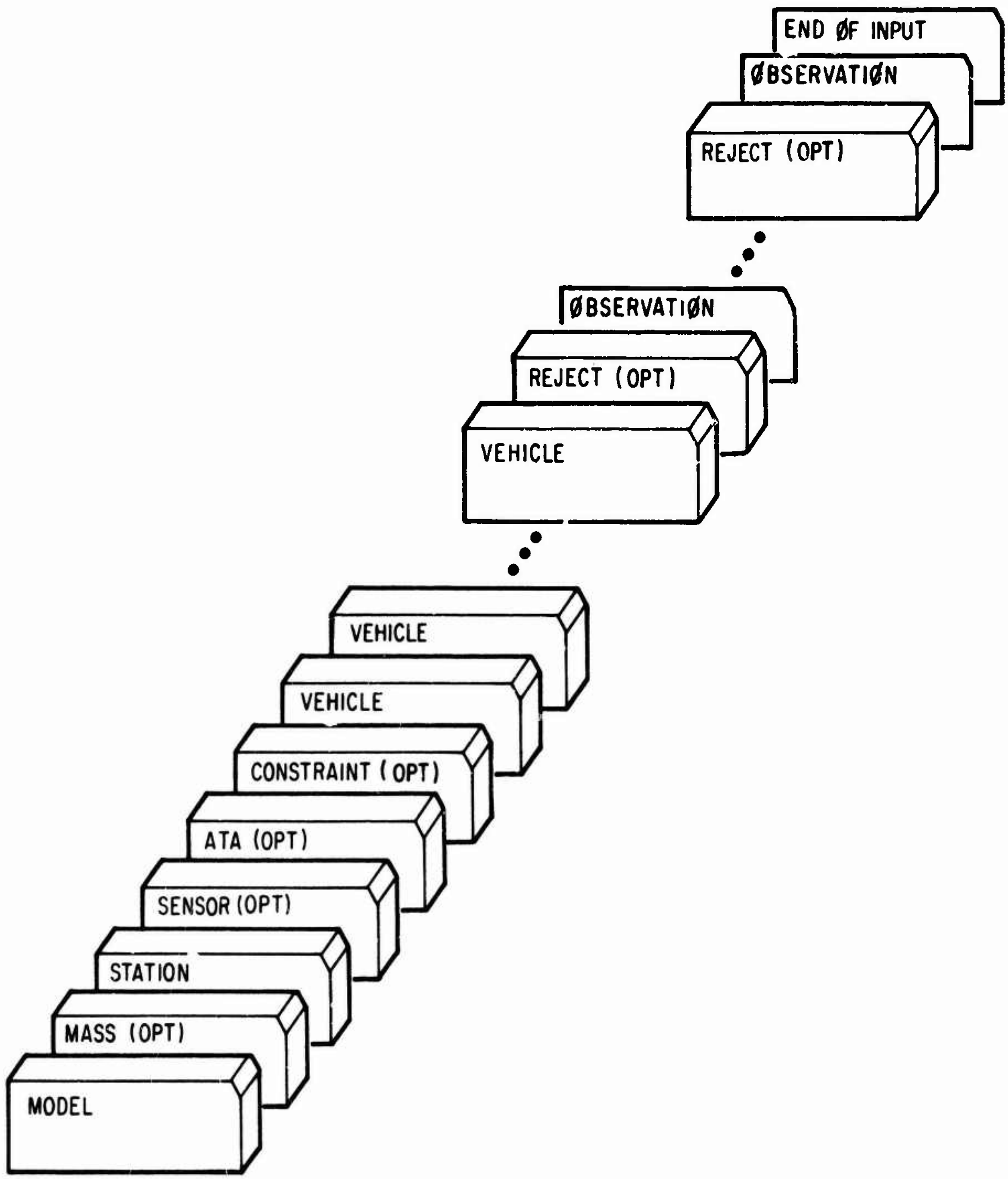


Fig. B-4. Deck Setup for a Multiple-Arc Orbit Determination Run with Card Image Observation File Input

B.1.5 Single-Vehicle Differential Correction with Binary Observation File Input

Orbit determination for one vehicle with an input binary observation file (TAPE3) requires one model group of input data blocks and the VEHICLE block only from the vehicle group (Fig. B-5). The input item BTIME (Sec. 11.2.1) in the VEHICLE block contains the last observation time (or a later time) on the file. This time is considered in determining the final integration time. Note that no REJECT or OBSERVATION data blocks are allowed when a binary observation file is used.

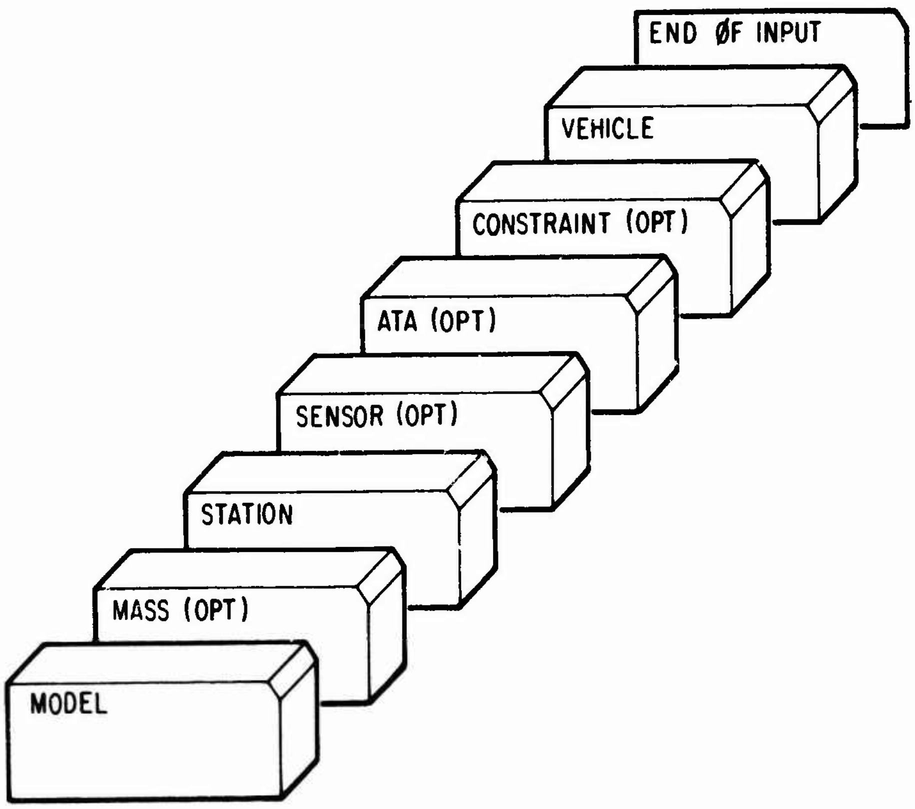


Fig. B-5. Deck Setup for a Single-Vehicle Differential Correction Run with Binary Observation File Input

B.1.6 Multiple-Arc with Binary Observation File Input

The deck setup for a multiple-arc orbit determination run with binary file observation input is shown in Fig. B-6. Observational measurements from many vehicles are used, but each item of data is associated with only one vehicle. One model group is input, and one VEHICLE block per vehicle is input. Each VEHICLE block contains the input item BTIME (Sec. 11.2.1), which indicates the last observation time (or a later time) on the binary observation file (TAPE3) for this vehicle. These times are considered in determining the final integration time for each vehicle.

Since all vehicles are assumed to be independent, a complete set of appropriate VEHICLE data should be provided for each. Input data not overridden is carried from one vehicle to the next. Again, note that no REJECT or OBSERVATION data blocks are allowed when a binary observation file is used.

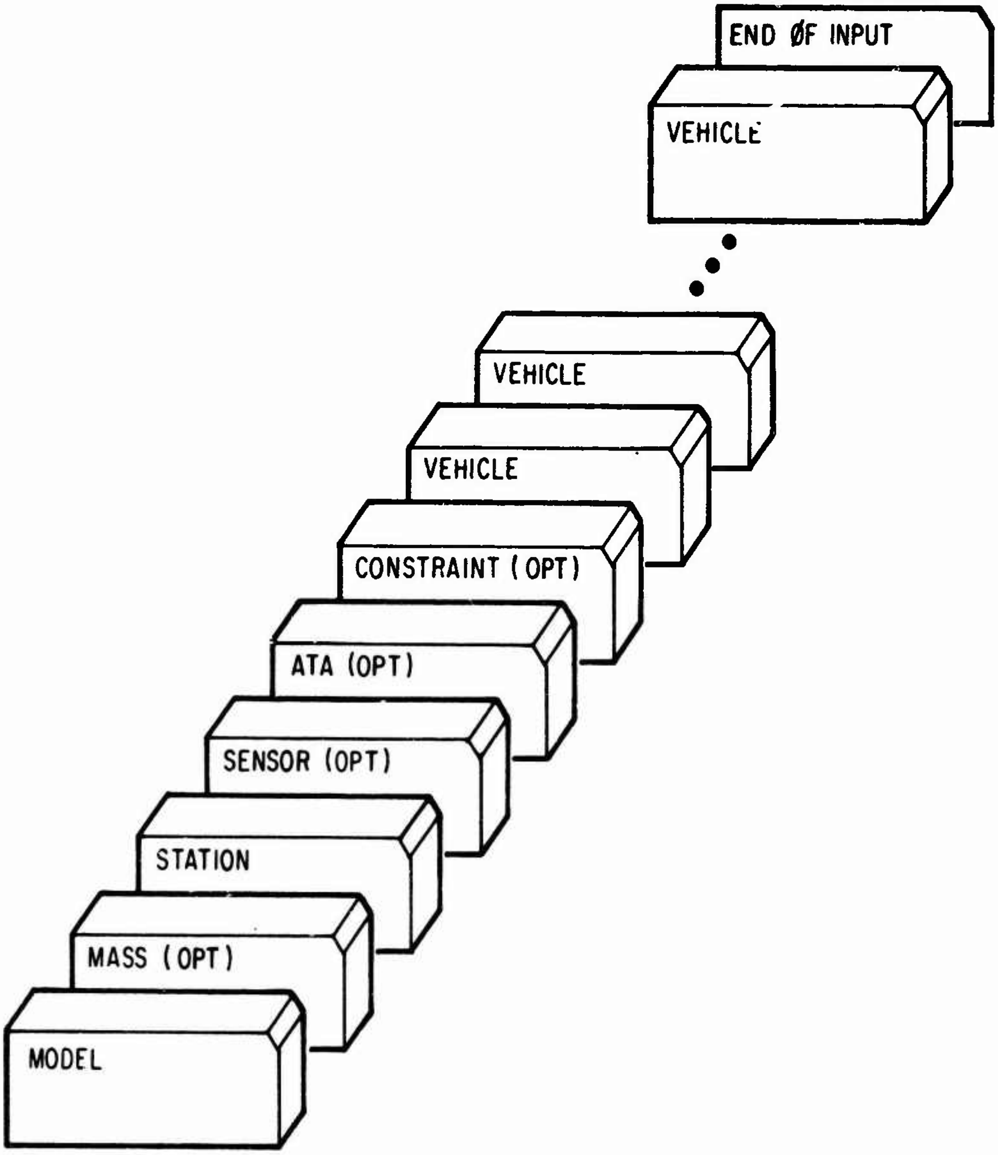


Fig. B-6. Deck Setup for a Multiple-Arc Orbit Determination Run with Binary Observation File Input

B.2 EPHEMERIS GENERATION RUN (ITIN=3)

B.2.1 Single-Vehicle

The deck setup for a single-vehicle ephemeris generation run (Fig. B-7) consists of the following: the MODEL and the (optional) MASS data blocks from the model group and the VEHICLE block. The VEHICLE block must contain the input item PTIM (Sec. 11.3.1.1), which indicates the print times and the final integration time.

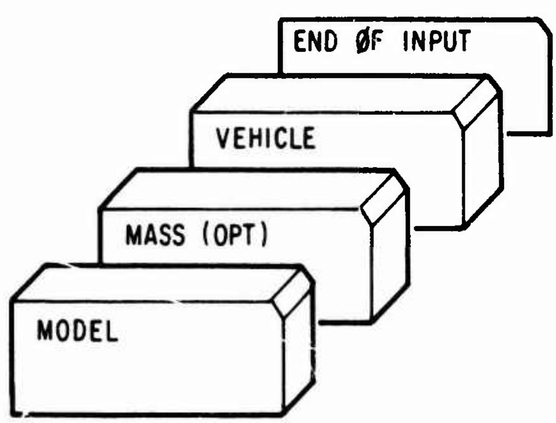


Fig. B-7. Deck Setup for a Single-Vehicle Ephemeris Generation Run

B.2.2 Multiple-Arc

The deck setup for an ephemeris generation run with several vehicles (Fig. B-8) consists of one set of MODEL and the (optional) MASS data blocks and one block of VEHICLE data per vehicle. The input item PTIM (Sec. 11.3.1.1) is specified in each VEHICLE block to indicate the print times and the final integration time for each vehicle. In the VEHICLE block, input data not overridden is carried over from one vehicle to the next.

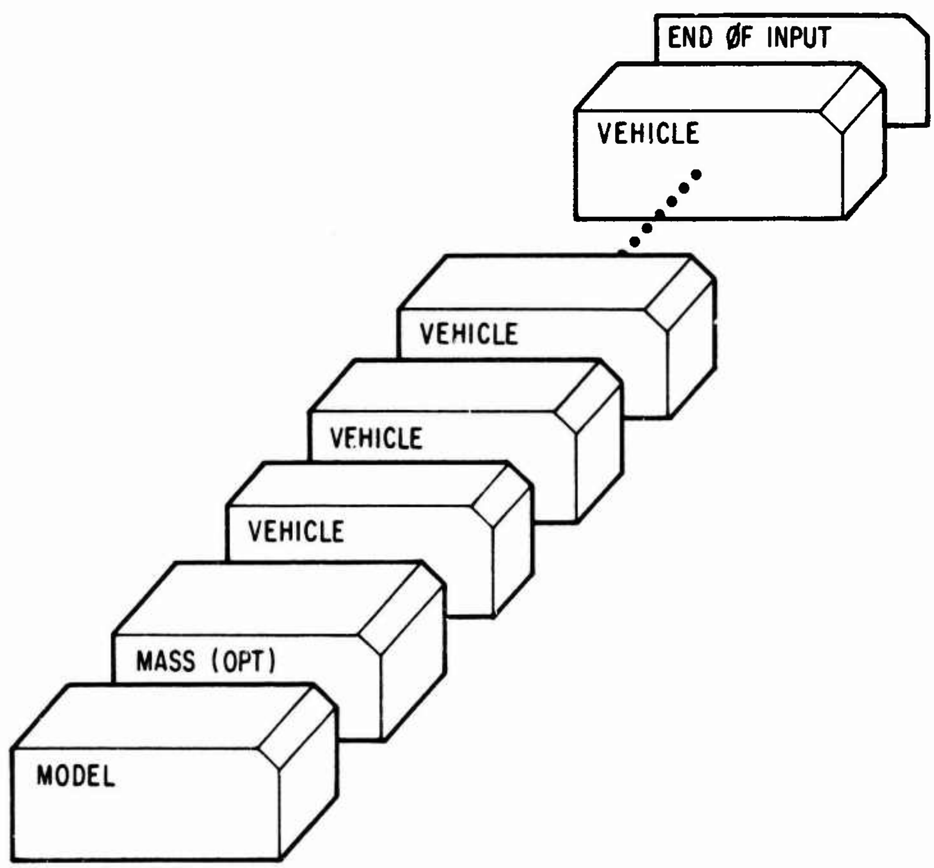


Fig. B-8. Deck Setup for a Multiple-Arc Ephemeris Generation Run

B.3 MEASUREMENT DATA GENERATION RUN (ITIN=4)

B.3.1 Single-Vehicle

The deck setup for a single-vehicle measurement data generation run (ITIN=4) requires one set each of the model and vehicle groups of input data blocks, including MODEL, STATION, VEHICLE, DATA GENERATION, and the optional MASS and SENSOR blocks (Fig. B-9).

The DATA GENERATION input block includes both DATA GENERATION I and II cards (Sec. 12) unless the VEHICLE block contains the input item JRIST=1 (Sec. 11.4.1). In this case, the DATA GENERATION II cards are omitted.

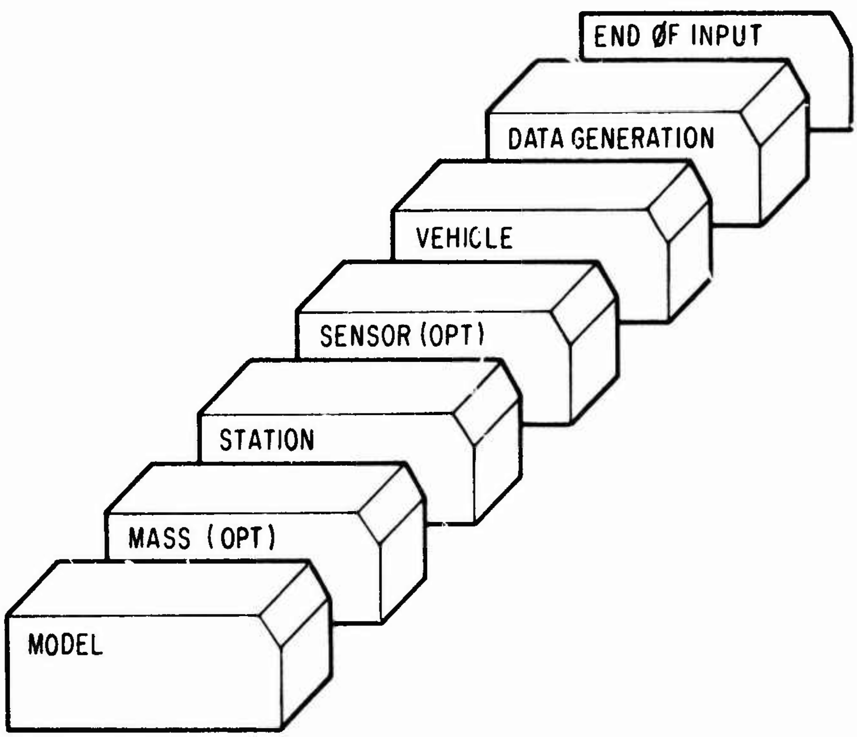


Fig. B-9. Deck Setup for a Single-Vehicle Data Generation Run

B.3.2 Multiple-Arc

The multiple-arc data generation deck (Fig. B-10) contains one set of model group data blocks and one set per vehicle of the vehicle group data blocks (VEHICLE and DATA GENERATION cards). If the VEHICLE block contains the input item JRIST=1 (Sec. 11.4.1), the DATA GENERATION II cards are omitted from the DATA GENERATION data block (Sec. 12).

Note that all vehicles are assumed to be independent; therefore, a complete set of VEHICLE and DATA GENERATION blocks should be provided for each vehicle. For convenience, in the VEHICLE block, input data not overridden is carried over from one vehicle to the next.

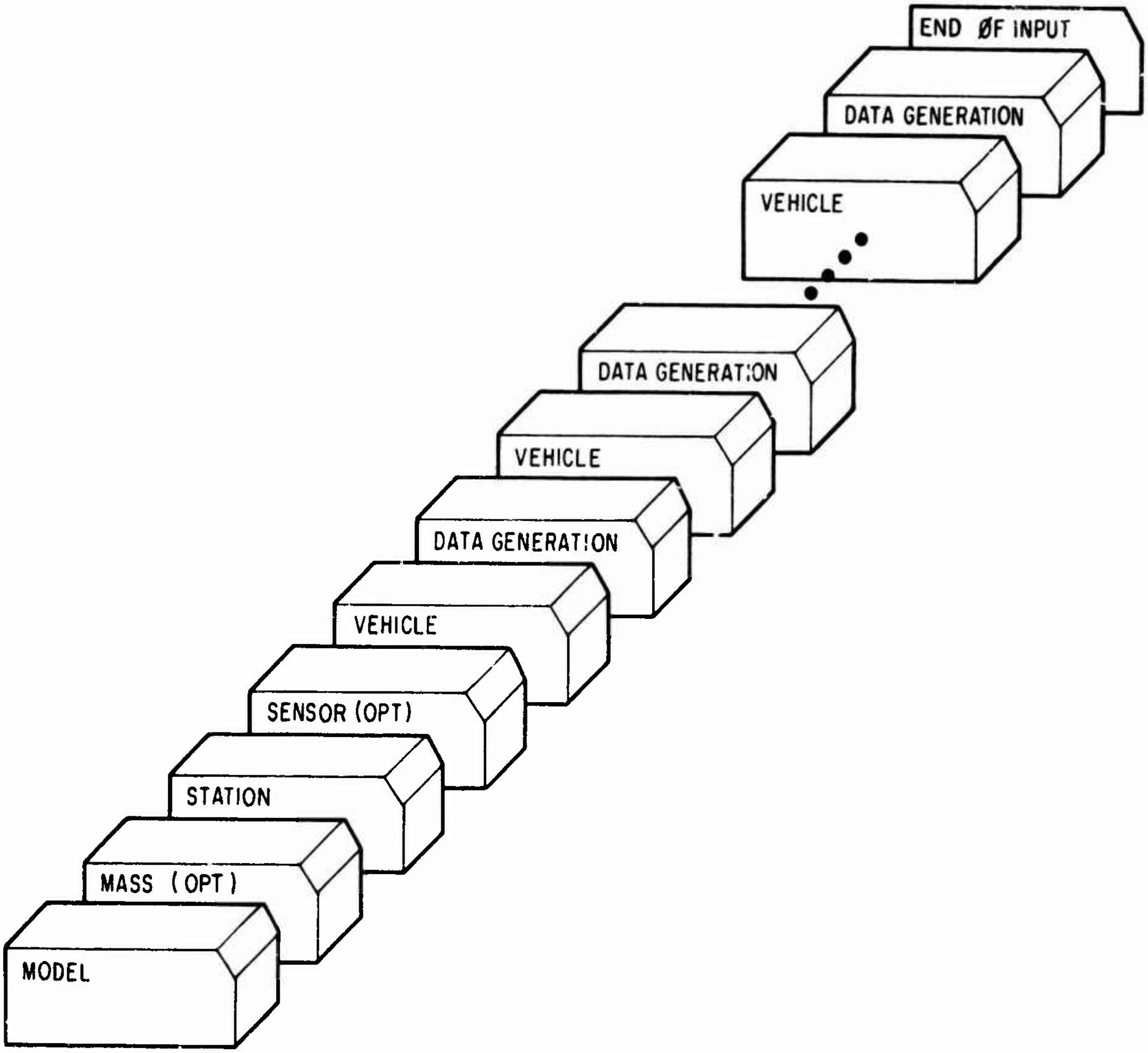


Fig. B-10. Deck Setup for a Multiple-Arc Data Generation Run

B.4 COVARIANCE ANALYSIS RUN (ITIN=5)

Deck setups for single-vehicle covariance analysis runs always contain the same basic model groups of input data blocks (MODEL, MASS, STATION, SENSOR, ATA, and COVQ), whereas the vehicle data blocks (VEHICLE and DATA GENERATION) and observation data blocks (REJECT and OBSERVATION) are variable. Various deck setups for covariance runs are shown in Figs. B-11 through B-15.

Input/output options are specified in the MODEL data block by input items ØPBØX and PRCØV (Sec. 2.5.1). The model P/Q parameter specifications are found in the input items ØPRAM, MPRAM, and GPRAM (Sec. 2.1.5).

A priori input for the normal matrix A^TA or the variance-covariance matrix $(A^TA)^{-1}$ is specified in the ATA data block (Sec. 6). A priori input for Q-parameters is specified via the COVQ data block (Sec. 8).

Vehicle-dependent P- and Q-parameters and the print schedule are specified by input items VPRAM (Sec. 11.1.14) and PTIM (Sec. 11.5.1).

Observational measurement times may be specified by:

- OBSERVATION cards
- Card image observation file (TAPE4)
- Binary observation file (TAPE3)
- DATA GENERATION data block input.

When the observational measurement times are specified by card image tape or card images, measurement times may be rejected by inputs to the REJECT data block.

In case of an update to an input A^TA or $(A^TA)^{-1}$ matrix, no measurement times are required [ØPBØX(D) and ØPBØX(E), Sec. 2.5.1].

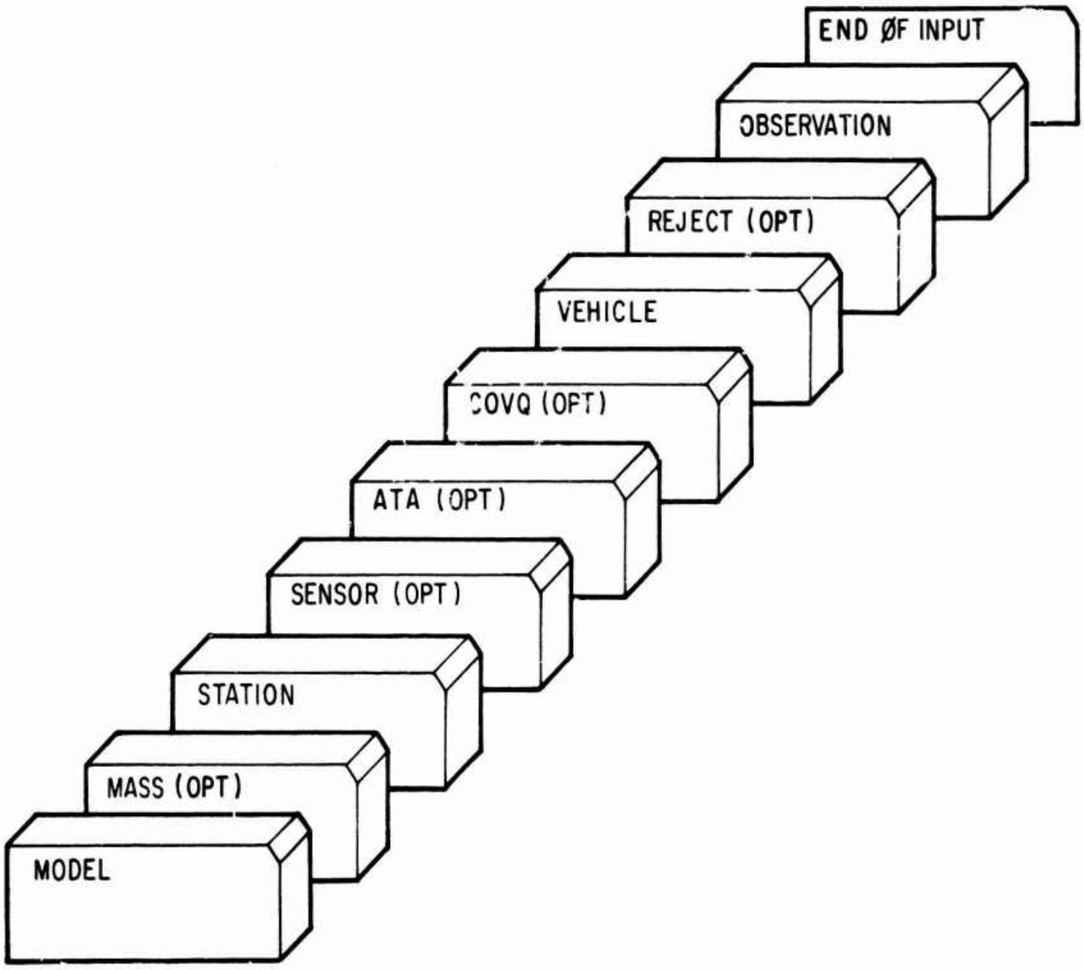


Fig. B-11. Deck Setup for a Covariance Analysis Run with OBSERVATION Card Input

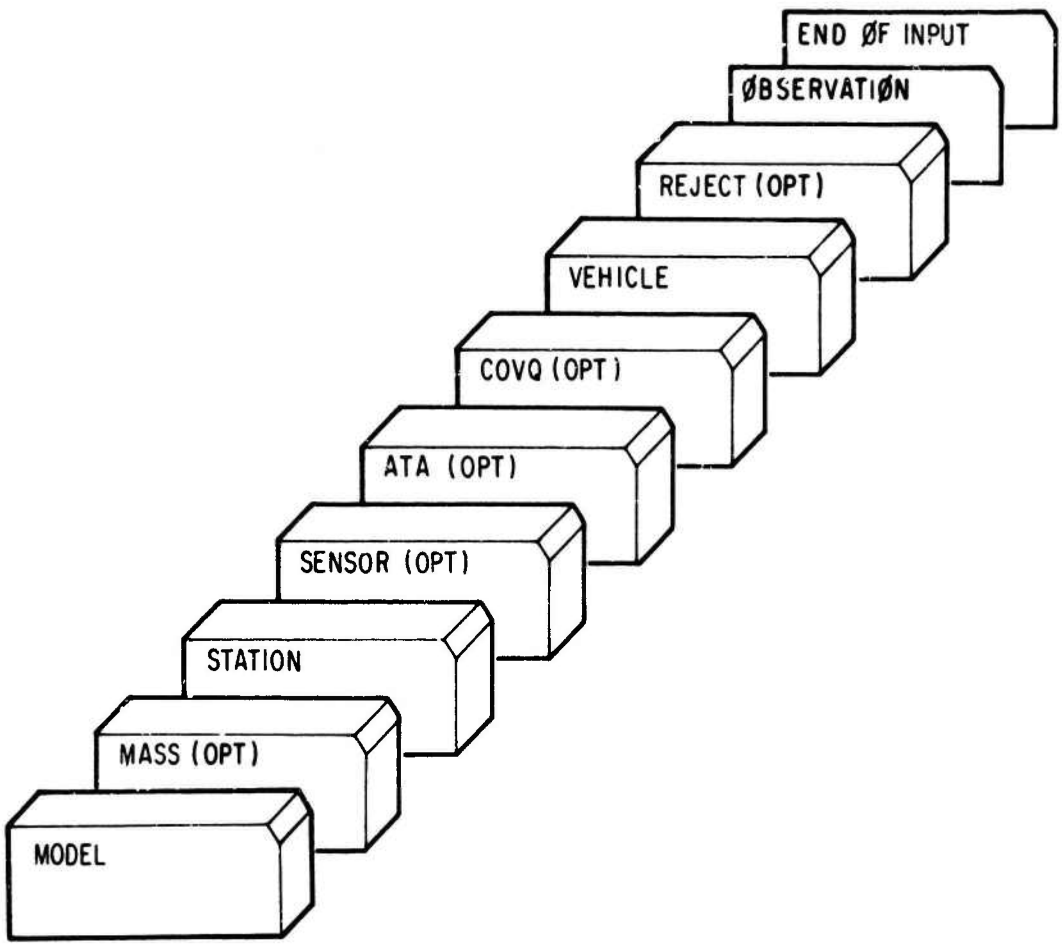


Fig. B-12. Deck Setup for a Covariance Analysis Run with Card Image Observation File Input

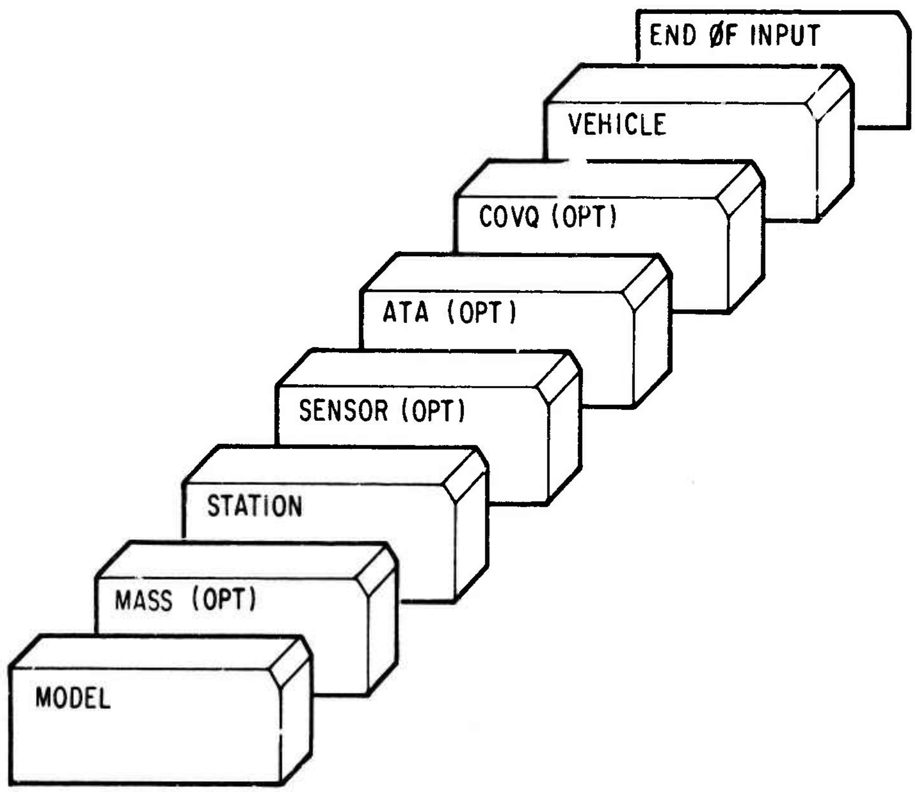


Fig. B-13. Deck Setup for a Covariance Analysis Run with Binary Observation File Input

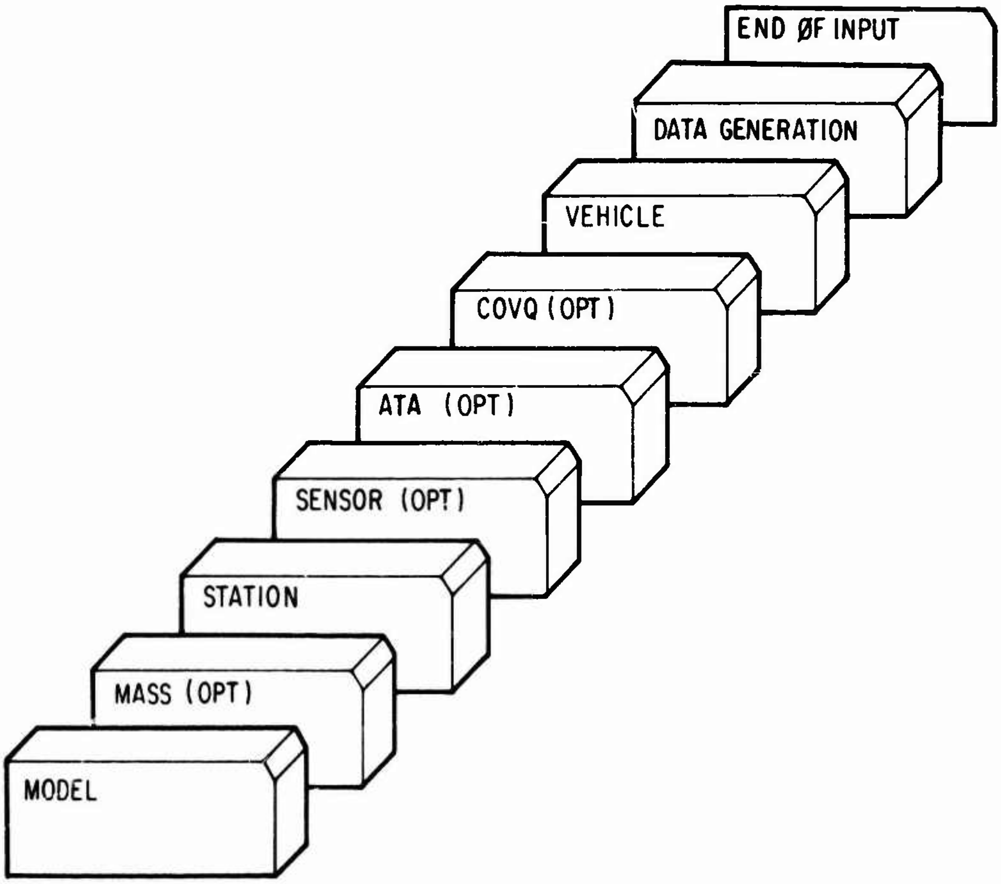


Fig. B-14. Deck Setup for a Covariance Analysis Run with Data Simulation

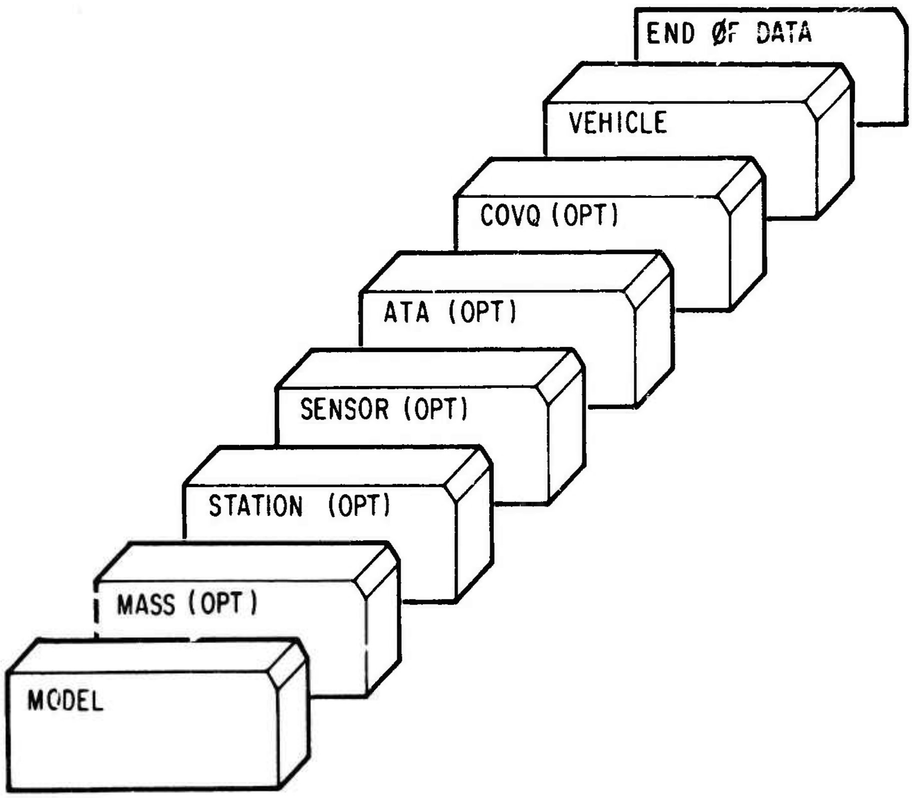


Fig. B-15. Deck Setup for a Covariance Analysis Update Only Run

B.5 MULTIPLE ITINERARY

B.5.1 Ephemeris and Data Generation (ITIN=34)

The deck setup for a case in which an ephemeris generation and a data generation are desired for the same vehicle, using the same model group blocks, is shown in Fig. B-16. Included in the MODEL and VEHICLE data blocks are all input items required for both the ephemeris generation and the data generation runs. Even though an ephemeris generation run does not require STATION, SENSOR, or DATA GENERATION input blocks, they are included in the deck setup because a data generation run does require them.

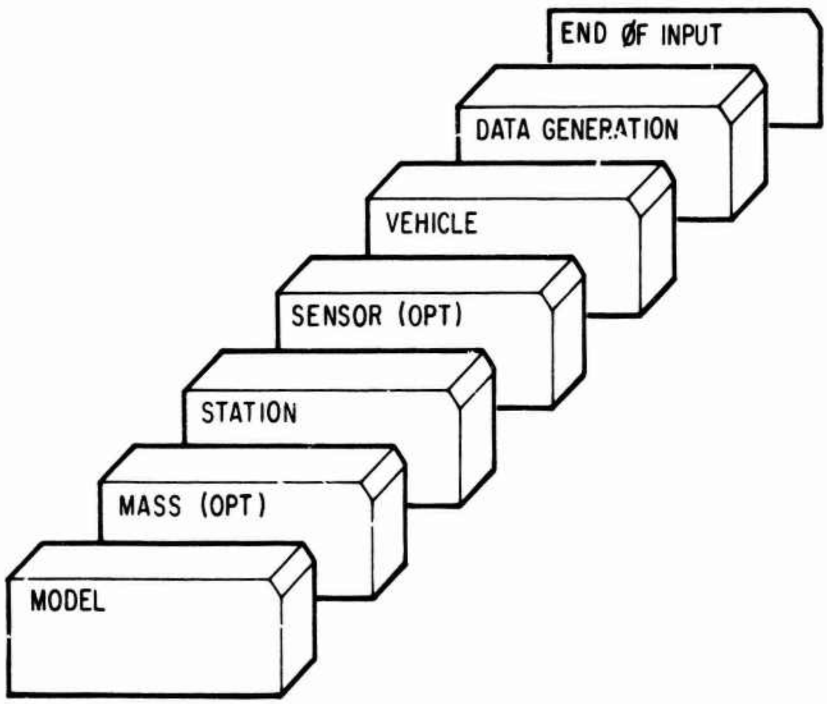


Fig. B-16. Deck Setup for a Multiple-Itinerary Run (ITIN = 34)

B.5.2 Multiple Itinerary (ITIN=3452345)

The deck setup for Example B (Sec. 1.4.1) is shown in Fig. B-17. In this case, the initial ITIN functions 3, 4, and 5 cause the generation of the nominal ephemeris, the look angles, and the covariance analysis, respectively. Reconstruction takes place starting from the nominal initial values. When the iterations terminate, the trajectory for the converged solution is used to repeat the three processing functions.

The MODEL and VEHICLE data blocks contain the necessary input items for all functions. The STATION cards are necessary for ITIN functions 2, 4, and 5. The optional ATA data block can contain A^TA or $(A^TA)^{-1}$ (Sec. 6). It is used for the orbit determination and/or the covariance analysis functions. The DATA GENERATION cards are necessary to generate the look angles, and the OBSERVATION block contains the measurements used in the covariance analysis and orbit determination steps.

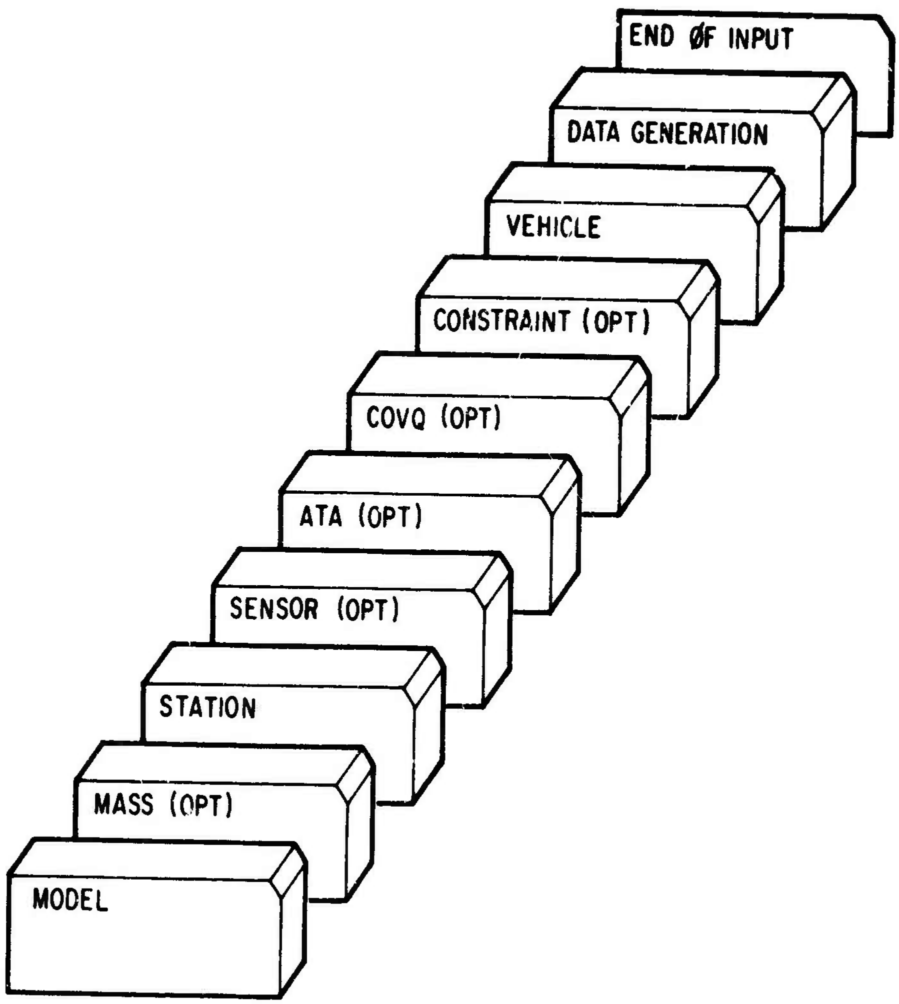


Fig. B-17. Deck Setup for a Multiple-Itinerary Run (ITIN = 3452345)

B.5.3 Multiple Itinerary (ITIN=323)

The deck setup for Example A (Sec. 1.4.1) is shown in Fig. B-18. A trajectory is generated from the input initial conditions, and an ephemeris is generated and output. Then, another trajectory is reconstructed from the observational data, and comparable ephemeris output is printed. The VEHICLE data specifies the nominal initial conditions for the trajectory, the amount of printed output, and the vehicle parameters to be differentially corrected in the reconstruction.

The observational measurements can be input by cards, card image file, or binary observation file (Sec. 11.2.1). If a card image file is used, the OBSERVATION block consists of a single card, with ØBSERVATIØN in Columns 1 through 11. If the binary observation file is used, no REJECT or OBSERVATION data blocks are allowed.

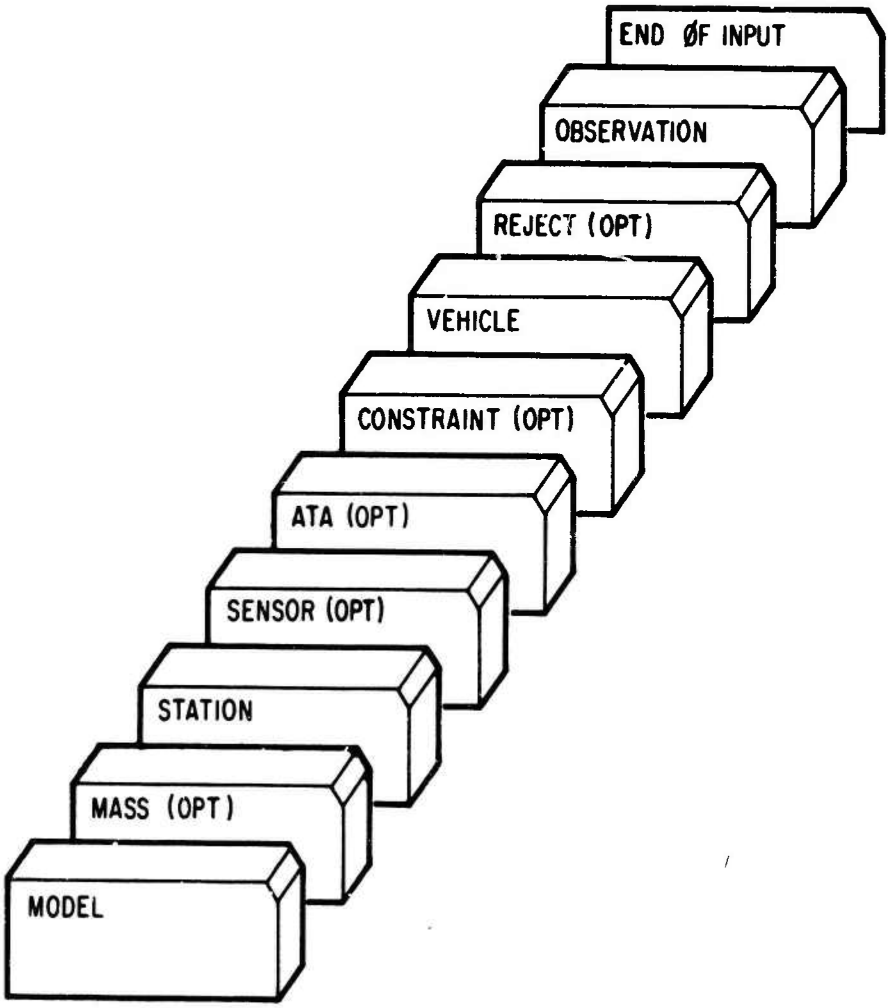


Fig. B-18. Deck Setup for a Multiple-Itinerary Run (ITIN = 323)

B.6 STACKED CASES (ITIN=34 FOLLOWED BY ITIN=2)

This data deck setup is used for Cases A and B of Appendix C (Fig. B-19). In Case A, an ephemeris is generated, and observational measurements are simulated. These measurements are written on a card image observation file (TAPE4) and are then used in the orbit determination run of Case B. Note that in the first case, from the MODEL block to the first END ØF INPUT, the data block setup is as described in Secs. B.2.1 and B.3.1. The VEHICLE data also includes input item ETAPE≠0 (Sec. 11.4.1), so the observational measurements are written on the card image observation file.

The ITIN=2 function is considered an entirely new case because nothing is retained from the first case; new model, vehicle, and observation group inputs are therefore included. The STATION input must be repeated, and the ØBSERVATIØN card must be followed by the END ØF INPUT card. Input item BCDIN≠0 (Sec. 11.2.1), specified in the second VEHICLE block, indicates that the observations are on the card image observation file, and BTIME (Sec. 11.2.1) indicates the time of the last observation.

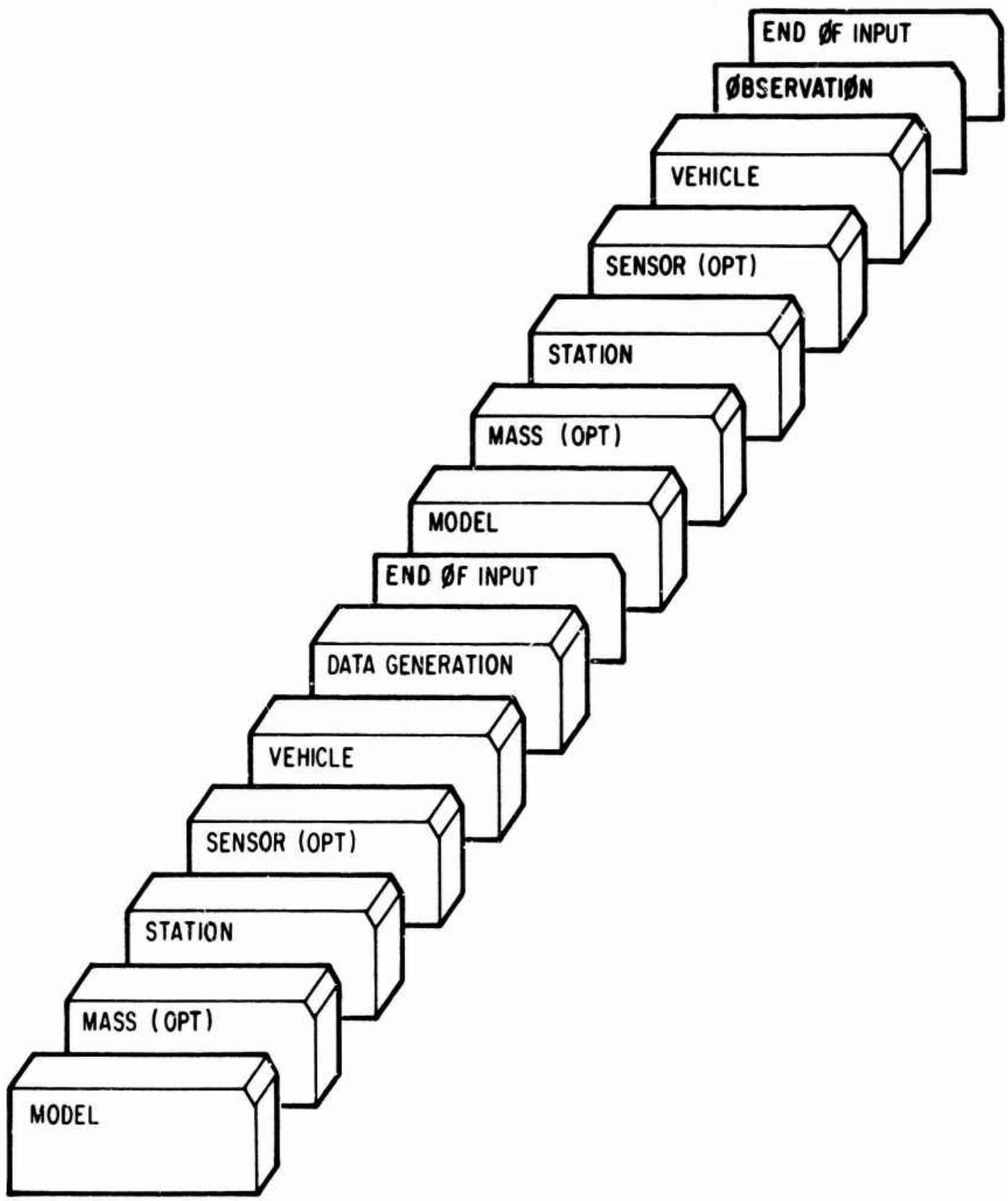


Fig. B-19. Deck Setup for Stacked Cases (ITIN = 34, ITIN = 2)

B.7 SIMULTANEOUS VEHICLES

B.7.1 Orbit Determination (ITIN=2, MULTV≠0)

The deck setup is shown (Fig. B-20) for many vehicles in simultaneous orbit that have the same model. The VEHICLE data blocks are input sequentially. Each requires a VEHID (Sec. 11.1.2) and the final integration time specified by BTIME (Sec. 11.2.1), but the integration times of the first vehicle must span those of any subsequent vehicles. Since the REJECT cards are time-dependent, not vehicle-dependent, only one block is input.

Only one OBSERVATION block, containing the measurements from all vehicles, can be input. In this case, actual OBSERVATION cards are shown. If this data were input by the card image observation file (TAPE4), the block of cards would be replaced by a single OBSERVATION card. If it were input by the binary observation file (TAPE3), there would be no REJECT or OBSERVATION data blocks.

The optional ATA block may contain an A^TA or $(A^TA)^{-1}$ matrix (Sec. 6). If MULTV=2 or 3, the STAGE data block (Sec. 14) is optional, and if MULTV=2, the DEWM data block (Sec. 7) is optional.

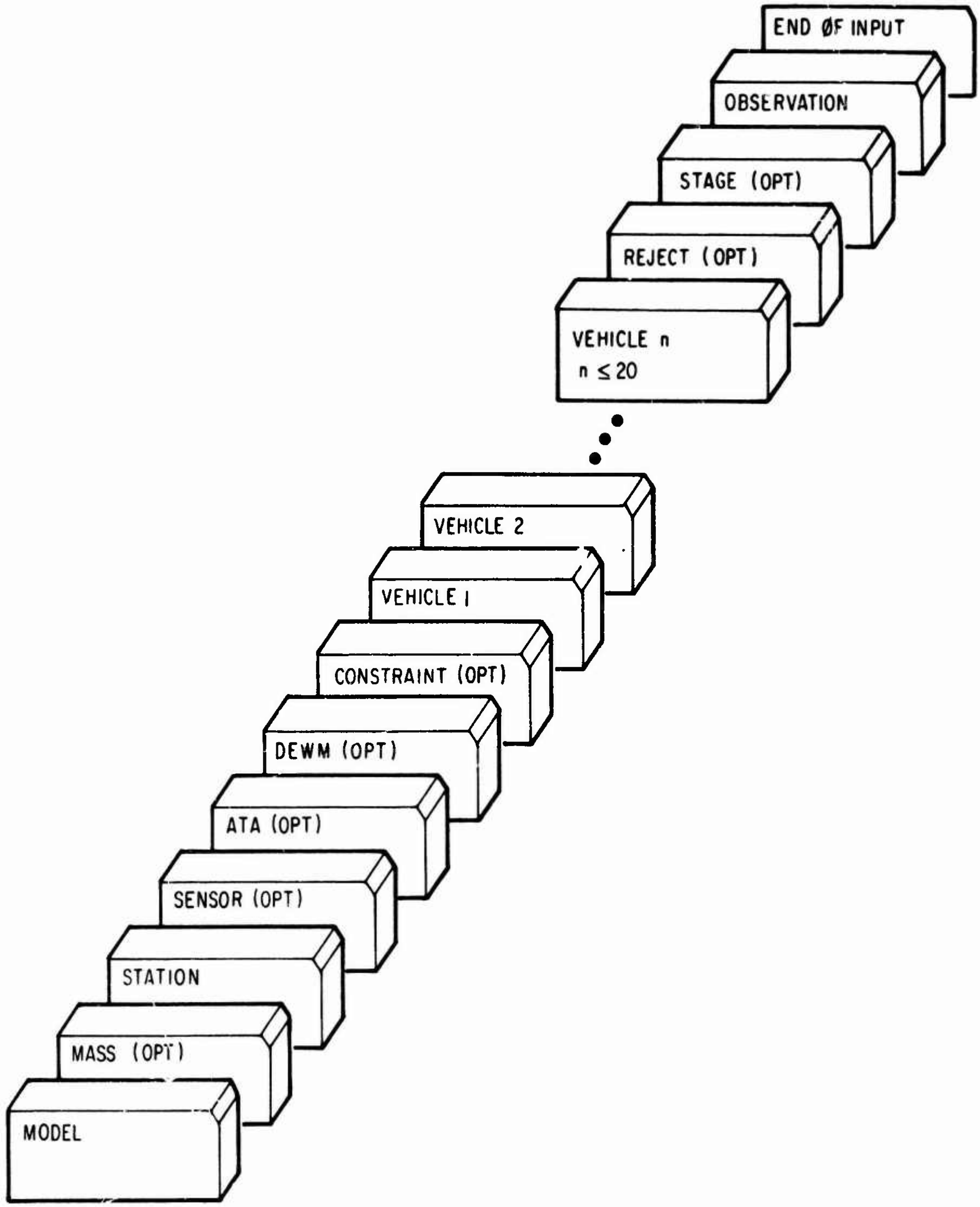


Fig. B-20. Deck Setup for a Simultaneous-Vehicle Differential Correction Run with OBSERVATION Card Input

B.7.2 Data Generation (ITIN=4, MULTV≠0)

The deck setup for generating data for vehicles simultaneously in orbit that have the same model is illustrated in Fig. B-21. Each VEHICLE data block contains a VEHID (Sec. 11.1.2).

Only one DATA GENERATION block is input; it contains DATA GENERATION I (Sec. 12.1) and II (Sec. 12.2.2) cards.

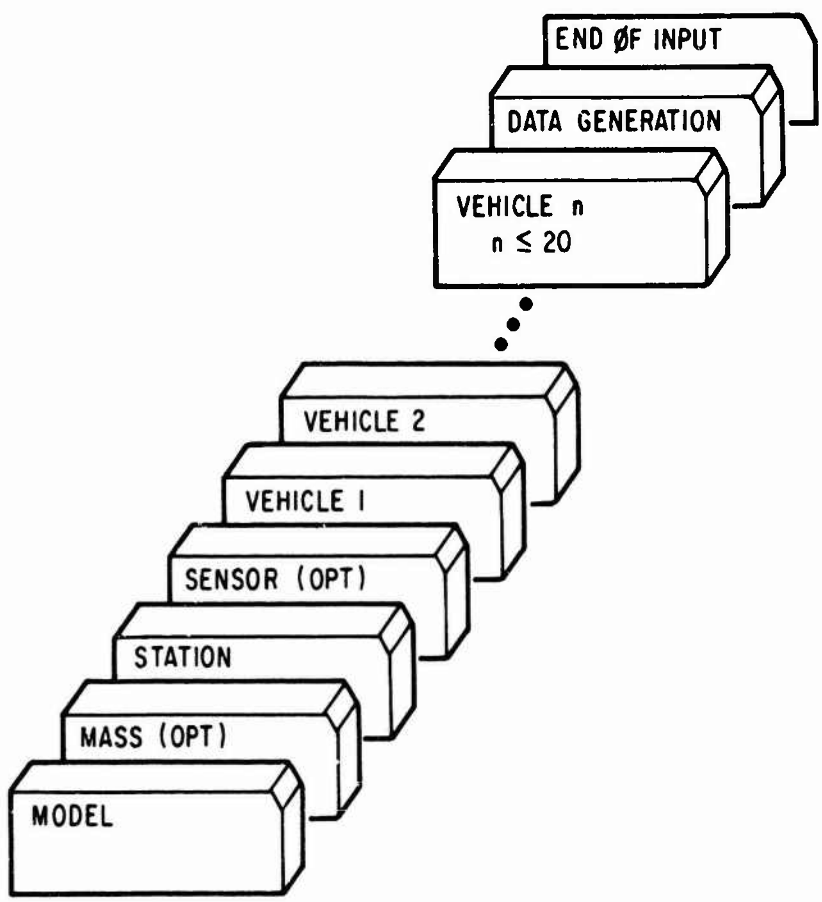


Fig. B-21. Deck Setup for a Simultaneous-Vehicle Data Generation Run

B.7.3 Covariance Analysis (ITIN=5, MULTV=1,2)

The deck setup for a simultaneous-vehicle covariance analysis run (Fig. B-22) is basically the same as that for a single vehicle (Sec. B.4). The main difference is that, since the vehicles are in simultaneous orbit, all VEHICLE data blocks are input before the DATA GENERATION, REJECT, or OBSERVATION data blocks.

Each vehicle requires a VEHID (Sec. 11.1.2), and the first requires the input of PTIM (Sec. 11.5.1). The integration times of the first vehicle must span those of any subsequent vehicles.

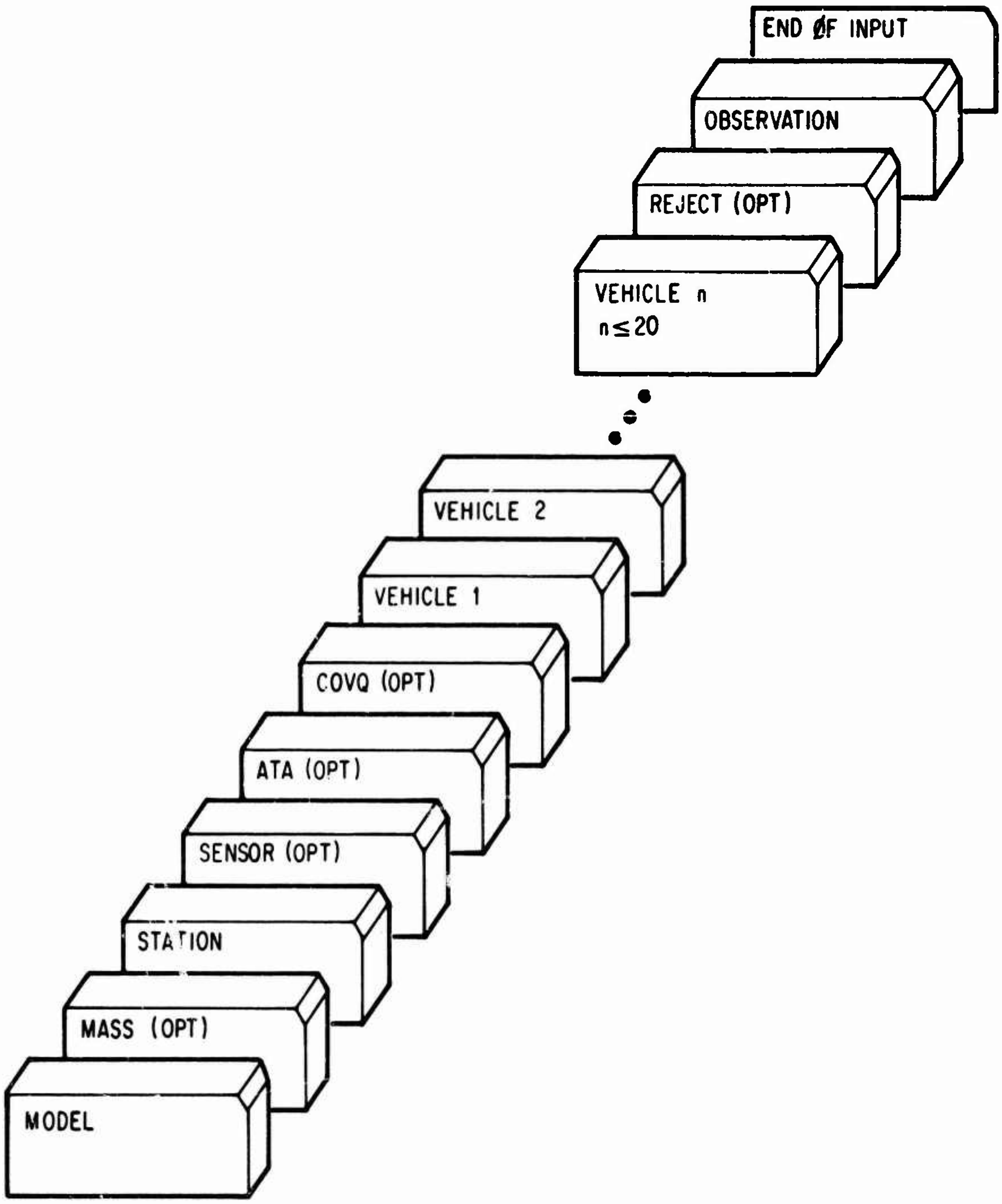


Fig. B-22. Deck Setup for a Simultaneous-Vehicle Covariance Analysis Run with OBSERVATION Card Input

C. SAMPLE OUTPUT DESCRIPTIONS

TABLES

SAMPLE OUTPUT DESCRIPTIONS

C.1 INTRODUCTION

The printed output produced by the TRACE Program is described here for typical differential correction, ephemeris generation, data generation, and covariance analysis runs. The samples that follow are of actual output listings, annotated to reference specific portions of the output data. Wherever applicable, the output items described are cross-referenced to the corresponding input definition section in this document. If an item occurs in more than one sample listing, a citation is given only for the first appearance.

The sample test cases included here are:

- Test Case A — ECI single-vehicle ephemeris generation and simulated measurement data generation run (ITIN = 34)
- Test Case B — ECI single-vehicle orbit determination run (ITIN = 2)
- Test Case C — ECI simultaneous-vehicle covariance analysis run (ITIN = 5)
- Test Case D — MCI single-vehicle ephemeris generation run (ITIN = 3)
- Test Case E — ECI single-vehicle, powered flight ephemeris generation run (ITIN = 3).
- Test Case F — ECI simultaneous-vehicle orbit determination run (ITIN = 2)
- Test Case G — ECI simultaneous-vehicle data generation run (ITIN = 4)

The symbol $\sim\!\sim\!\sim$, used throughout the sample output, indicates that some output has been omitted. Note that many output pages without descriptive interruption have been included only to provide continuity. Cases A through D were run on TRACE Version 6.96 and Cases E through G on Version 7.27.

C.2 TEST CASE A: ECI SINGLE-VEHICLE EPHEMERIS GENERATION AND SIMULATED MEASUREMENT DATA GENERATION RUN (ITIN = 34)

```
                                         +++++
                                    ++++       ++++
                                 +++               +++
TTTTTTTTTTTT    RRRRRRRRRR     +                AA     +       CCCCCCCCCCC    EEEEEEEEEEE
TTTTTTTTTTTT    RRRRRRRRRRR   +               AAAA      +      CCCCCCCCCCC    EEEEEEEEEEE
     TT         RR        RR  +             AA  AA      +      CC             EE
     TT         RRRRRRRRRRR  +           AA     AA       +     CC             EEEEEE
     TT         RRRRRRRRRR   +        AAAAAAAAAA         +     CC             EEEEEE
     TT         RR       RR  +      AAAAAAAAAAAA         +     CC             EE
     TT         RR        RR  +  AA             AA      +      CCCCCCCCCCC    EEEEEEEEEEE
     TT         RR        RR  + AA              AA      +      CCCCCCCCCCC    EEEEEEEEEEE
                                +   VERSION 6.96 (1) +
                                 +++   4/20/71   +++
                ( 04/23/71 ) (2)    ++++       ++++      TRACE-66(AD104A) (3)
                                         +++++
```

ITEM	DESCRIPTION	REFERENCE SECTION
1	Identification number of the program version and its date	
2	Date on which run is made	
3	Program identification for accounting purposes: AD104A is the Aerospace IPD (Information Processing Division) identification number	

Preceding page blank

```
MODEL DATA
INFOPM1                 INTERM4              MTERMS04,60                    CARD  1
D     02,00                 1082.76E-5             0                        CARD  2
D     03,00                 -2.693E-6              0                        CARD  3
D     04,00                 -1.56E-6               0                        CARD  4
D     02,02                 1.544E-6                 -0.765E-6              CARD  5   4
DITIN 34                                                                    CARD  6
 RSPLT5                                                                     CARD  7
 H0   2.0                HMIN 2.0             HMAX 2.0                      CARD  8
END                                                                         CARD  9

****************************************** LUNAR GRAVITY MODEL ******************************************

GM = 6.8023265000E-05 ER**3/MIN**2  = 1.7313995407E+14 FT**3/SEC**2  = 4.9027777038E+12 M**3/SEC**2   5
        ***SPHERICAL MOON***

****************************************** EARTH GRAVITY MODEL ******************************************

GM = 5.5303935000E-03 ER**3/MIN**2  = 1.4076535841E+16 FT**3/SEC**2  = 3.9860318297E+14 M**3/SEC**2
           NO NORMALIZATION WITH    4 TERMS.
     N   M      CNM             SNM        **   N   M       CNM              SNM                       6
     2   0   1.08276000E-03   0.           **   4   0   -1.56000000E-06   0.
     3   0  -2.69300000E-06   0.           **   2   2    1.54400000E-06  -7.65000000E-07

****************************************** PHYSICAL CONSTANTS ******************************************

GM(ER**3/MIN**2)   =  5.533393500E-03   OMEGE(RAD/MIN) =  4.375269100E-03  GMLAT(DEG)   =  7.830000000E+01
GMKM(KM**3/MIN**2) =  0.                OMEGA(RAD/MIN) =  4.375269100E-03  GMLNG(DEG)   =  2.910000000E+02
SGM(ER**3/MIN**2)  =  6.802326500E-05   OMEGL(RAD/MIN) =  0.               AM(ER)       =  2.725062770E-01
ERFT(FT/ER)        =  2.092573800E+07   ERKM(KM/ER)    =  6.378164900E+03  ERNM(NM/ER)  =  3.443933600E+03  7
FTKM(FT/KM)        =  3.280839000E+03   FTNM(FT/NM)    =  6.076115500E+03  AE(ER)       =  1.000000000E+00
GSUB0(FT/SEC**2)   =  3.217400000E+01   DGREE(DEG)     =  5.729577951E+01  SLT          =  2.820176300E+03
CKEP               =  1.000000000E-07   F              =  3.352329869E-03  PI           =  3.141592654E+00

****************************************** INPUT/OUTPUT CONVERSION FACTORS ******************************************

DF(I/O-ER) =  2.09257380E+07   VF(I/O-ER/MIN) =  3.48752300E+05   AF(I/O-ER/MIN**2) =  5.81270500E+03  8
```

ITEM	DESCRIPTION	REFERENCE SECTION
4	Card images of the input MODEL data:	
	NFØRM, NTERM, TERMS (geopotential inputs) ITIN (function indicator) RSPLT (rise/set plot indicator) H0, HMIN, HMAX (numerical integration inputs)	2.1.2.2 2.1 2.4.1.1 2.1.4
5	Lunar gravity model, including the moon's gravitational constant in three unit systems. In this case, the moon's gravity model is spherical	2.1.2 2.1.1
6	Earth's gravity model, including the earth's gravitational constant in three unit systems. In this case, the gravity model is expressed by a spherical harmonic expansion with C and S coefficients, and there is no normalization	2.1.2 2.1.1
7	Input physical constants and OMEGL:	
	OMEGL (lunar rotation rate)	2.1.1
8	Input/output conversion factors for distance, velocity, and acceleration; always using er, er/min, and er/min^2 internally	2.1.1

```
***************************************** INTEGRATION INPUTS *****************************************

 IFORM =    1              IDENT  =   1              NSTEP =    2
 NPCMP =    0              IR     =   8              ER    = 1.00000000E-10   9
 HMIN  = 2.00000000E+00    HMAX   = 2.00000000E+03   HO    = 2.00000000E+00

***************************************** SPECIAL OPTIONS *****************************************

 TAPE2  =    0    TAPE7  =    0    TELEM  =    0    PTAPE  =    0    NPDOT  =     0
 PRHO   =    0    NODPR  =    0    CLASS  =    0    LEMSP  =    0    PTNS   =10000   10

***************************************** CRASH ALTITUDE *****************************************

 ECI CRASH ALTITUDE(FT) =   3.000000000E+05        MCI CRASH ALTITUDE(FT) =   3.000000000E+03   11

***************************************** STATION LOCATIONS *****************************************
STATION     SIG   REF   PA-REF   DATUM   TYPE          LATITUDE          LONGITUDE         HEIGHT        P    Q
                                                           X                 Y               Z
                                                         RADIUS           LATITUDE        LONGITUDE

 001          0     1      1       -0      -0       3.48000000E+01    2.39500000E+02   6.00000000E+02
 004          0     1      1       -0      -0       5.76000000E+01    2.07800000E+02   4.26000000E+02
 005          0     1      1       -0      -0       2.16000000E+01    2.01700000E+02   9.41000000E+02          12
 006          0     1      1       -0      -0       4.29000000E+01    2.88350000E+02   7.84000000E+02
 009          0     1      1       -0      -0       7.55000000E+01    2.91400000E+02   3.96000000E+02

ENTER SEGMENT 01 AT     78.3 SECONDS.  EXECUTION TIME FOR SEGMENT  0 WAS    78.3 CP SECS.,    228.4 PP SECS.   13
```

ITEM	DESCRIPTION	REFERENCE SECTION
9	Integration inputs and ICENT	2.1.4
	ICENT (central force term evaluation indicator)	
10	Special options:	
	TAPE2	2.1.4
	PRHØ	2.1.2.4
	TAPE7	2.1.3
	NØDPR	2.1.4
	TELEM	2.1.4
	CLASS	2.2.1, 2.4.1.6, 2.5.1
	LEMSP	2.1.4
	NPDØT≡INTEG(13) (the period decay rate is printed at every integration step)*	
	PTNS=n≡INTEG(16) (the trajectory equations are printed every n integration steps)	
11	ECI and MCI crash altitudes at which to stop integrating	2.1.4
12	Printout of the station locations as input. If CLASS ≠ 0, the actual locations are left blank	4
13	Program segment identification. Frequently, when different segments are entered, a remark is printed indicating the segment and its time of entry (from the beginning of the run). The amount of time taken for the segment last executed is also printed	

*Information Processing Division, TRACE66 Orbit Determination Program, Vol. III: Trajectory Generation Equations and Methods, TOR-0066(9320)-2, Vol. III, The Aerospace Corp., El Segundo, Calif. (25 April 1970). This report is Ref. 2 of Part A.

```
************************************************ VEHICLE DATA **************************************************

   H1     70-170                                                                           CARD   1
   IVEHID1                    IYEAR 1964           IMNTH 8                                 CARD   2
   IDAY   16                   TZNE 0               HR    0                                CARD   3
    MIN   727                  SEC  0              IICTYP2                                 CARD   4
    IC    351.5                2    0               3     90                               CARD   5
    4     354.475              5    21351065.       6     25855.914                        CARD   6  (14)
   IIDRAG1                     DRAS .0116                                                  CARD   7
   IETAPE4                                                                                 CARD   8
   DPRCDEX                                                                                 CARD   9
    PTIM 0                     2    1               3     760                              CARD  10
    4    40                    5    1320                                                   CARD  11
   END                                                                                     CARD  12

    DATA GENERATION I
STATION  INTERVAL  MIN.ELE.  MAX.ELE.   MAX.RANGE     START TIME        STOP TIME      AZIMUTH1  AZIMUTH2
          (SEC.)   (DEG.)    (DEG.)     (N.MI.)    DA  HR   MIN     DA  HR   MIN      (DEG.)    (DEG.)
  001     60.00     -0.00     -0.00      -0.       -0  -0 -0.0000   -0  22 -0.0000    -0.0      -0.0
  004     60.00     -0.00     -0.00      -0.       -0  -0 -0.0000   -0  22 -0.0000    -0.0      -0.0
  005     60.00     -0.00     -0.00      -0.       -0  -0 -0.0000   -0  22 -0.0000    -0.0      -0.0
  006     60.00     -0.00     -0.00      -0.       -0  -0 -0.0000   -0  22 -0.0000    -0.0      -0.0
  009     60.00     -0.00     -0.00      -0.       -0  -0 -0.0000   -0  22 -0.0000    -0.0      -0.0
                                                                                                         (15)
    DATA GENERATION II
STATION
         RNG   R.D   P     E.D   LAT   HI-   VAR   ATT   GEO   ASN   TWD   TNT
         AZT   P.D   Q     RDD   LON   DOP   KAP   XYZ   HRA   ADD   AXY   GCR
         ELE   Q.D   A.D   UJV   SUR   LOK   ASP   TOP   U,V   EDD   LMN   SPR
  001  *X  X  X*    *     *     *     *     *     *     *     *     *     *     *
  004  *X  X  X*    *     *     *     *     *     *     *     *     *     *     *
  005  *X  X  X*    *     *     *     *     *     *     *     *     *     *     *
  006  *X  X  X*    *     *     *     *     *     *     *     *     *     *     *
  009  *X  X  X*    *     *     *     *     *     *     *     *     *     *     *

70-170 (16)
     EPOCH                                        INITIAL CONDITIONS
   YR/MO/DAY           X,Y,Z,DX,DY,DZ         A,D,B,A,R,V            A,E,I,O,U,TAU          AF,AG,N,L,CHI,PSI
TZNE,HR,MIN,SEC        2.11221173338E+07      3.51600000000E+02      2.16545058487E+07      1.38625022642E-02
 1964/ 8/16           -3.11902823323E+06      0.                     1.40128272088E-02     -2.04703623737E-03
 0.                (17)0.                     9.00000000000E+01      9.55250000000E+01      6.74602827921E-02  (18)
 0.                   -3.63661425026E+02      3.54475000000E+02      3.51599999932E+02      3.51600000000E+02
 7.27000000000E+02    -2.46271357763E+03      2.13510650000E+07      3.61314213347E-11     -1.60895386758E-01
 0.                    2.57357947412E+04      2.58559140000E+04      6.38058777822E+02      1.08958142631E+00

NO PLANETARY PERTURBATIONS.(19)

 ** ATMOSPHERE MODEL **   LOCKHEED(20)                  TIME              CDA/W               W/CDA
                                                   7.27000000E+02(21) 1.16000000E-02(22) 8.62068966E+01(23)
       D1   =  5.93000000E+00   D2 = -1.56840000E+01   FLUX =   0.(24)
```

ITEM	DESCRIPTION	REFERENCE SECTION
14	Card images of the input VEHICLE data: H1 VEHID YEAR, MNTH, DAY, TZNE, HR, MIN, SEC ICTYP, IC IDRAG DRAG ETAPE PRCDE PTIM	 11.1.1 11.1.2 11.1.3 11.1.4 11.1.8 11.1.9 11.4.1 11.3.1.2 11.3.1.1
15	Output from the DATA GENERATION I and II cards	12
16	Printout of the VEHICLE input H1 header card	11.1.1
17	Epoch time	11.1.3
18	Trajectory initial conditions are printed in four coordinate frames based on BCI coordinates. The initial condition values shown are the results of transformations applied to the input values. The transformation for the input coordinate set (in this case, α, δ, β, A, r, and v) consists of the conversion from decimal to octal numbers, the conversion of units from ft, deg, and sec to er, rad, and min; and the performance of the corresponding inverse conversions for output. The three other types of element sets require coordinate system transformations, in addition to the number and unit system transformations noted above. Accuracy of the values printed is therefore subject to numerical truncation roundoff errors Quantities in the left-hand column are position and velocity components in the basic vernal equinox coordinate system in ft and ft/sec. The second column gives the usual ADBARV spherical system coordinates (i.e., Type 2 initial conditions) in ft, ft/sec, and deg. The third column contains orbit semimajor axis, eccentricity, inclination, right ascension of ascending node, argument of perigee, and time of last perigee passage in MME. Other units are ft and deg. The right-hand column gives the vehicle coordinates in the f and g element set (valid for orbits such that $0 \le e < 1$) (Refs. 1 and 2)	11.1.4
19	Names of any solar system bodies included in the computation of perturbative accelerations	2.1.2.3
20	Identification of the atmospheric model to be used	11.1.8
21	Time at which to initially use the C_D A/W indicated in the next column in MME	11.1.9
22	The reciprocal of the ballistic coefficient C_D A/W	11.1.9
23	Ballistic coefficient W/C_DA.	11.1.9
24	The D1, D2, and flux expressions for the Lockheed atmospheric density model (for this case)	2.1.2.4.1

```
***************************************************************************************************************

ENTER SEGMENT 10 AT    78.8 SECONDS.  EXECUTION TIME FOR SEGMENT  1 WAS      .5 CP SECS.,     3.5 PP SECS.

          TRAJECTORY INTEGRATION FOR CASE    1 25

IVEP       0      ICENT      1      IDRAG      1      ALPHG    5.662162703E+00   CDAW 1.160000000E-02
JVEP       0      JNORM      1      IR         8      ALG-DEG  3.244180258E+02   ER   1.000000000E-10
MVEP       0      MAJOR      0      ISRP       0      TJDATE   2.438623500E+06   HMIN 2.000000000E+00
KVEP       0      NMASS      0      NEQS       3      TSTART   7.270000000E+02   HMAX 2.000000000E+00  26
LVEP       0      NT         4      RECMP      0      TSTOP    1.320000000E+03   HO   2.000000000E+00
IDENTX     1      JNORMX     0      NMASSX     0      FLIGHT   5.930000000E+02   NTX  0.
                                    NASA       0      SSTEP    1.000000000E+02   SORD 1.500000000E+00
                                           * PREDETERMINED EVENT TABLE *
 TIME(MME)     TYPE        ASSOCIATED QUANTITIES                                   27
   727.0000 TZERO
  1320.0000 TSTOP

        ***  TRAJECTORY START 28
                                                              29
        * * * * * * * * * * * * * * * * * * * *    ECI * * * * * * * * * * * * * * * * * * * *
SEG11 ENTRY TIME IS    78.93100

                   T  =       727.000000         H  =          .250000        NSTEP  =            0

                    2.112201788379E+07          -3.636604250256E+02          -3.049966727469E+01  30
                   -3.119028238232E+06          -2.462703577627E+03           4.503734134821E+00
                    0.                           2.573579474117E+04          -1.368599519737E-03


   FORCES         MAGNITUDE     X      Y      Z     ( EXTERNAL UNITS )      RADIAL        IN-TRACK      CROSS-TRACK
 GEOPOTENTIAL   3.083040E+01-3.049970E+01 4.503503E+00 1.174270E-04-3.083040E+01 1.455570E-04 2.851445E-04
 ATMOSPHERIC    1.504282E-03 3.413128E-05 2.311366E-04-1.486027E-03 1.344411E-17-1.501618E-03-8.948284E-05  31
 TOTAL          3.083040E+01-3.049967E+01 4.503734E+00-1.368600E-03-3.083040E+01-1.356061E-03 1.956617E-04
```

ITEM	DESCRIPTION	REFERENCE SECTION
25	Remark indicating the relative number of the vehicle being integrated (not VEHID)	
26	Quantities associated with the current vehicle (Table C-1)	
27	Event table, including times to start and stop integrating	
28	Start of integration	
29	Integration frame for the current vehicle (in this case, ECI)	
30	Time T; step size H; number of integration steps from NSTEP to T; and position, velocity, and acceleration components in Columns 1, 2, and 3, respectively, for this event (epoch) print (in MME, min, ft, ft/sec, and ft/sec^2)	
31	Forces at T	

Table C-1. Definitions of Initialized Integration Quantities

Symbol	Definition	Reference Section
IVEP	Number of C and S parameters (GPRAM)	2.1.5.2
JVEP	Number of other model parameters (ØPRAM)	2.1.5.3
MVEP	Number of mass parameters (MPRAM)	2.1.5.1
KVEP	Number of vehicle-dependent parameters (VPRAM)	11.1.14
LVEP	Number of delayed parameters (i.e., THRUST, DRAG, etc.)	11.1.14
ICENTX	Central force flag for the moon	
ICENT	Central force flag for the earth	
JNORM	Normalization for the earth gravity model	2.1.2.2
MAJOR	Flag for the integration of the variational equations	
NMASS	Number of masses in the earth gravity model	
NT	Number of terms in the earth gravity model	2.1.2.2
JNORMX	Normalization for the lunar gravity model	2.1.2.2
IDRAG	Flag indicating the atmospheric model used	11.1.8
IR	Ratio of Runge-Kutta to Cowell step size (H0/IR)	2.1.4
ISRP	Flag for solar radiation pressure	2.1.2.6
NEQS	Total number of equations to be integrated	
RECMP	Flag for recomputation of perturbations	2.1.4
NMASSX	Number of masses in the lunar gravity model	
NASA	Coordinate and timekeeping transformation option flag	2.1.4

Table C-1. Definitions of Initialized Integration Quantities (Continued)

Symbol	Definition	Reference Section
ALPHG	Right ascension of Greenwich (rad at midnight of epoch day)	
ALG-DEG	Right ascension of Greenwich (deg at midnight of epoch day)	
TJDATE	Julian date of epoch day	
TSTART	Trajectory start time (MME)	
TSTOP	Trajectory stop time (MME)	
FLIGHT	Duration of flight (TSTOP-TSTART, min)	
SSTEP	Number of integration steps specified per rev when the regularized time variable is used	11.1.6
CDAW	Reciprocal of the ballistic coefficient	
ER	Error control in integration ($ER = 1.^{-S}$, where S is the number of significant figures)	2.1.4
HMIN	Minimum absolute step size for integration	2.1.4
HMAX	Maximum absolute step size for integration	2.1.4
H0	Initial integration step size: A negative value indicates backward integration	2.1.4
NTX	Number of terms in the lunar gravity model	2.1.2.2
SORD	Power of the regularization transformation	11.1.6
CPAW	Solar radiation pressure coefficient	11.1.4
UTD	Correction that relates iteration time to ephemeris time, sec	2.1.4

```
*                 STEP    DOUBLED          T   =    739.250000     H   =        .500000     NSTEP   =        48   32
*                 STEP    DOUBLED          T   =    755.250000     H   =       1.000000     NSTEP   =        79
  NODE   T  =    7.715056082307E+02   -2.174312233991E+07   3.220848060321E+06    9.155402131023E-02   33
         DT =    1.000000000000E+00    3.538916113278E+02   2.392365839274E+03   -2.499914410018E+04
  NODE   T  =    8.160132498351E+02    2.111878462148E+07  -3.138242581735E+06    1.057768166002E-01
         DT =    1.000000000000E+00   -3.676358013866E+02  -2.462617183232E+03    2.573513801870E+04
  NODE   T  =    8.605088844192E+02   -2.173661142815E+07   3.240165570270E+06    9.162694120100E-02
         DT =    1.000000000000E+00    3.545031738123E+02   2.392907285641E+03   -2.500214730405E+04
  NODE   T  =    9.050141616566E+02    2.111560357750E+07  -3.157478550731E+06    1.052970851538E-01
         DT =    1.000000000000E+00   -3.715253959224E+02  -2.462027934117E+03    2.573440021394E+04
  NODE   T  =    9.495001485512E+02   -2.173012707833E+07   3.259487366782E+06    9.058326290414E-02
         DT =    1.000000000000E+00    3.550446520700E+02   2.392890505067E+03   -2.500511078411E+04
  NODE   T  =    9.940033497345E+02    2.111248671667E+07  -3.176721703786E+06    1.070233889849E-01
         DT =    1.000000000000E+00   -3.753122137674E+02  -2.460866515690E+03    2.573357343278E+04
  NODE   T  =    1.038480034411E+03   -2.172366357365E+07   3.278795075491E+06    8.716727127885E-02
         DT =    1.000000000000E+00    3.555426278197E+02   2.392411765957E+03   -2.500804218916E+04
  NODE   T  =    1.082981321138E+03    2.110940072490E+07  -3.195953658598E+06    1.088429841835E-01
         DT =    1.000000000000E+00   -3.790299919716E+02  -2.459392224658E+03    2.573269351510E+04
  NODE   T  =    1.127448861730E+03   -2.171717340606E+07   3.298071998920E+06    7.865032799414E-02
         DT =    1.000000000000E+00    3.560585150084E+02   2.391835442467E+03   -2.501098583350E+04
  NODE   T  =    1.171948128798E+03    2.110628623951E+07  -3.215162695717E+06    1.065998435399E-01
         DT =    1.000000000000E+00   -3.827440448012E+02  -2.458042725758E+03    2.573181925916E+04
  NODE   T  =    1.216406397356E+03   -2.171059451433E+07   3.317312624163E+06    6.158998121460E-02
         DT =    1.000000000000E+00    3.566534977233E+02   2.391583030237E+03   -2.501399732251E+04
  NODE   T  =    1.260903287159E+03    2.110309216343E+07  -3.234350508507E+06    9.425052306976E-02
         DT =    1.000000000000E+00   -3.865133472910E+02  -2.457180753738E+03    2.573099833463E+04
  NODE   T  =    1.305351933397E+03   -2.170388589968E+07   3.336525691455E+06    3.443219649954E-02
         DT =    1.000000000000E+00    3.573531955035E+02   2.391889239496E+03   -2.501711161410E+04

          T   =      1320.250000          H   =       1.000000        NSTEP   =        644

            -1.067370314174E+07          2.175825556370E+04         1.478330439997E+01   34
             3.489613873940E+06         -2.098591769807E+03        -4.744146117512E+00
            -1.859775240439E+07         -1.277447810391E+04         2.520901666549E+01


   FORCES       MAGNITUDE     X      Y      Z     ( EXTERNAL  UNITS )      RADIAL       IN-TRACK      CROSS-TRACK
 GEOPOTENTIAL   2.960655E+01 1.478331E+01-4.744146E+00 2.520901E+01-2.960652E+01 3.882527E-02 7.125906E-03
 ATMOSPHERIC    5.699119E-06-4.914114E-06 2.914771E-07 2.851771E-06 6.484690E-08-5.685813E-06 1.827404E-07   35
 TOTAL          2.960655E+01 1.478330E+01-4.744146E+00 2.520902E+01-2.960652E+01 3.881958E-02 7.126088E-03
```

ITEM	DESCRIPTION	REFERENCE SECTION
32	Change in step size, indicated by a remark, the time of change, the new step size, and the number of integration steps to this time	
33	Nodal crossing showing the time (MME) and position components on the first line and the step size (min) and velocity components (ft/sec) on the second line	
34	Event detection print (Item 30)	
35	Forces at time T	

```
***  TRAJECTORY TERMINATION (36)

***  THIS CASE TOOK      1.805  SECONDS TO INTEGRATE A SPAN OF    593.2500  MINUTES  ***
   ***  FROM        727.000  TO       1320.250  MINUTES FROM MIDNIGHT OF EPOCH  ***      (37)
ENTER SEGMENT 50 AT     80.7 SECONDS.  EXECUTION TIME FOR SEGMENT 10 WAS     1.9 CP SECS.,     9.0 PP SECS.
```

ITEM	DESCRIPTION	REFERENCE SECTION
36	Remark at trajectory termination	
37	Number of seconds to integrate the time span of the current vehicle	

*** TRACE66 EPHEMERIS OUTPUT KEY ***

DATE,...	ME,MM,ST,DT	X,Y,Z,R	DX,DY,DZ,V	LAT,...	ALPHA,...	REV,...	REMARKS
MO/DAY/YR	MIN FROM EPOCH	X (FT)	DX (FT/SEC)	LATITUDE (DEG)	ALPHA (DEG)	REV COUNT	.
HR/MIN	MIN FROM MIDNIGHT	Y (FT)	DY (FT/SEC)	LONGITUDE(DEG)	DELTA (DEG)	PERIOD	.
SEC	SEC FROM MIDNIGHT	Z (FT)	DZ (FT/SEC)	ALTITUDE (NM)	BETA (DEG)	PER-DECAY	.
	STEP SIZE(MIN)	R (FT)	V (FT/SEC)	S-VEH-LAT(DEG)	AZIMUTH(DEG)	NOD-RES	.

30

* * * ECI TRAJECTORY * * * 30

ITEM	DESCRIPTION	REFERENCE SECTION
38	<u>TRACE ephemeris output key</u>. Date column includes the current month, day, year, hour, minute, and second. The next column contains the times from epoch and midnight of current date and the current step size. The following columns contain the components and magnitude of the radius vector from body center to satellite (ft) and the components and magnitude of the velocity vector (ft/sec). LAT contains the latitude, longitude, altitude, and subvehicle latitude; ALPHA is self-explanatory; and REV always contains the rev count plus (at an ascending node) the period for one revolution, the period-decay rate, and the nodal regression. The remarks column is used to indicate the reason for printing (if other than the print time vector)	11.3.1
39	<u>The integration frame for this vehicle</u>	11.1.6

```
***   CASE      1 (40)
***   70-170 (41)


***   EPOCH PRINT

DATE,...    ME,MM,ST,DT         X,Y,Z,R            DX,DY,DZ,V           LAT,....        ALPHA,....       REV,...
 8/16/64        0.00000     2.11220179E+07    -3.63550425E+02     0.00000000    351.59999959      .02333
 12/ 7        727.00000    -3.11302824E+06    -2.46270358E+03   204.93437636      0.00000000     0.00000
 0.00000    43620.00000     0.                 2.57357947E+04    69.99982        90.00000000     0.00000
                 .25000     2.13510650E+07     2.58559140E+04     0.00000000    354.47499959     0.00000      (42)
  A   =   2.16545058E+07    MEAN  ANOM   =   3.60000000E+02    APOGEE   =    3.61381331E+03
  E   =   1.40128272E-02    ECCENTRIC    =   3.60000000E+02    HEIGHT   =    1.69879706E+02
  I   =   9.55250000E+01    TRUE  ANOM   =   3.60000000E+02    PERIGEE  =    3.51393342E+03
  O   =   3.51600000E+02    KEPL  PER    =   8.89412222E+01    HEIGHT   =    6.99998225E+01
  U   =   3.61314213E-11    ANOM  PER    =   8.90819493E+01    O-DOT    =    8.51446431E-01
 TAU  =   6.38058778E+02    NODL  PER    =   8.90175033E+01    U-DOT    =   -4.21677378E+00

***   REQUESTED PRINTS (43)

DATE,...    ME,MM,ST,DT         X,Y,Z,R            DX,DY,DZ,V           LAT,....        ALPHA,....       REV,...
 8/16/64        0.00000     2.11220179E+07    -3.63550425E+02     0.00000000    351.59999959     1.00000    ASC NODE
 12/ 7        727.00000    -3.11302824E+06    -2.46270358E+03   204.93437636      0.00000000     0.00000          (44)
 0.00000    43620.00000     0.                 2.57357947E+04    69.99982        90.00000000     0.00000
                 .25000     2.13510650E+07     2.58559140E+04     0.00000000    354.47499959     0.00000

DATE,...    ME,MM,ST,DT         X,Y,Z,R            DX,DY,DZ,V           LAT,....        ALPHA,....       REV,...
 8/16/64       73.00000    -1.54411960E+07    -1.76837291E+04    45.25874547    177.13628383     1.37408
 12/40        760.00000     7.72413983E+05     4.32536701E+03    22.19807322     45.06635191     0.00000      (45)
 0.00000    45600.00000     1.54363530E+07    -1.74819005E+04   164.46761        89.43019977     0.00000
                1.00000     2.18838176E+07     2.52399240E+04    45.24996466    187.82931795     0.00000

DATE,...    ME,MM,ST,DT         X,Y,Z,R            DX,DY,DZ,V           LAT,....        ALPHA,....       REV,...
 8/16/64       44.50561    -2.17431223E+07     3.53894348E+02    -.00000609    171.57394639     1.50000    DSC NODE
 12/51        771.50561     3.22084829E+06     2.39236543E+03    13.75145825     -.00000605     0.00000
 30.33659   46290.33659    -2.32091378E+00    -2.49991441E+04   173.57223        89.99888575     0.00000
                1.00000     2.19903829E+07     2.51158488E+04    -.00000609    185.52555726     0.00000
```

ITEM	DESCRIPTION	REFERENCE SECTION
40	Number of the case on the trajectory file (TAPE2)	
41	Printing the input VEHICLE H1 header card	11.1.1
42	Epoch print (Item 38) plus three other columns. The first contains the classical elements a, e, i, Ω, ω, and τ in ft, deg, and MME. The second column contains the mean, eccentric, and true anomalies in deg and the Keplerian, anomalistic, and nodal periods in min. The last contains the radial distance and height above the oblate earth at both perigee and apogee in nmi. The nodal regression rate $\dot{\Omega}$ and the rate of advance of the line of apsides $\dot{\omega}$ are printed in deg/day	11.1.4
43	Output requested by PRCDE and PTIM follows	11.3.1.1 11.3.1.2
44	Ascending node print (Item 38)	
45	Print requested by PTIM (Item 38)	11.3.1.1

```
DATE,...   ME,MM,ST,DT        X,Y,Z,R            DX,DY,DZ,V          LAT,...       ALPHA,...      REV,...
 8/16/64      533.90328   2.11030922E+07   -3.86509399E+02    -.00000908   351.28640839    7.00000    ASC NODE
 21/ 0       1260.90328  -3.23435018E+06   -2.45718136E+03   70.77953188     -.00000902   88.95515
54.19710    75654.19710  -3.36225350E+00    2.57309983E+04      69.74369    90.02172268    -.01166
                1.00000   2.13495087E+07    2.58509459E+04    -.00000908   354.47846382    -.05220

DATE,...   ME,MM,ST,DT        X,Y,Z,R            DX,DY,DZ,V          LAT,...       ALPHA,...      REV,...
 8/16/64      553.00000   3.79739708E+06   -2.48359677E+04   77.70761100   325.17057615    7.21919
 21/20       1280.00000  -2.64257032E+06    3.29827419E+03   39.87645005    77.62732148    0.00000
 0.00000    76800.00000   2.10921800E+07    5.24858129E+03     120.95062    89.20585407    0.00000
                1.00000   2.15937032E+07    2.55978810E+04   77.70489301   333.35817387    0.00000

DATE,...   ME,MM,ST,DT        X,Y,Z,R            DX,DY,DZ,V          LAT,...       ALPHA,...      REV,...
 8/16/64      578.35194  -2.17038859E+07    3.57354474E+02    -.00000287   171.26037154    7.50000    DSC NODE
 21/45       1305.35194   3.33652580E+06    2.39188904E+03  239.61090808     -.09000285    0.00000
21.11633    78321.11633  -1.09188644E+00   -2.50171116E+04     170.02827    89.97667859    0.00000
                1.00000   2.19588494E+07    2.51337365E+04    -.00000287   189.52164962    0.00000

DATE,...   ME,MM,ST,DT        X,Y,Z,R            DX,DY,DZ,V          LAT,...       ALPHA,...      REV,...
 8/16/64      593.00000  -1.11983977E+07    2.15332700E+04  -57.64199647   162.54791699    7.66081
 22/ 0       1320.00000   3.52054757E+06   -2.02713773E+03  227.22641232   -57.46778205    0.00000
 0.00000    79200.00000  -1.84033097E+07   -1.31505126E+04     156.78157    90.64933992    0.00000
                1.00000   2.18234258E+07    2.53125855E+04  -57.63441492   190.29659789    0.00000

DATE,...   ME,MM,ST,DT        X,Y,Z,R            DX,DY,DZ,V          LAT,...       ALPHA,...      REV,...
 8/16/64      593.25000  -1.08737031E+07    2.17582556E+04  -58.61936726   162.20745342    7.66358    PST-EVNT
 22/ 0       1320.25000   3.48950387E+06   -2.09859177E+03  226.82327764   -58.44804353    0.00000
15.00000    79215.00000  -1.85977524E+07   -1.27744781E+04     156.24617    90.65737993    0.00000
                1.00000   2.18240956E+07    2.53162358E+04  -58.61193680   190.58496505    0.00000
   A  =   2.16900275E+07     MEAN ANOM  =   2.42343660E+02     APOGEE  =   3.61624033E+03      48
   E  =   1.30320787E-02     ECCENTRIC  =   2.41586307E+02     HEIGHT  =   1.72322910E+02
   I  =   9.55158746E+01     TRUE ANOM  =   2.41030959E+02     PERIGEE =   3.52319860E+03
   D  =   3.51255664E+02     KEPL PER   =   8.91501580E+01     HEIGHT  =   7.92811798E+01
   U  =   3.57853864E+02     ANOM PER   =   8.90042174E+01     D-DOT   =   8.45137218E-01
 TAU  =   1.26022945E+03     NODL PER   =   8.89399172E+01     U-DOT   =  -4.19310098E+00

          ***  END OF TRAJECTORY  *** 47

ENTER SEGMENT 60 AT     82.0 SECONDS.  EXECUTION TIME FOR SEGMENT 50 WAS     1.2 CP SECS.,     5.7 PP SECS.
```

ITEM	DESCRIPTION	REFERENCE SECTION
46	Post-event prints. In this case, the event was termination. The output contains the items described in the ephemeris output key (Item 38) and the three additional columns in Item 42	
47	A remark indicating the end of the trajectory ephemeris	

```
* VEHICLE CASF    1 *
                                              48
   * * DATA GENERATION FOR VEHID     1 * *

                                  ************
                                  AUG. 16,1964  49
                                  ************

005  RISE   AT  12  HR   9  MIN   25.84 SEC       ELEVATION =   0.00 DEGREES,   AZIMUTH = 171.88 DEGREES  50
  005 12 HR  9 MIN 60.00 SEC  5.5794568E+02(RNG)  1.7220949E+02(AZI)  2.7696341E+00(ELE)  51
  005 12 HR 10 MIN 60.00 SEC  3.0839567E+02(RNG)  1.7349298E+02(AZI)  1.1207660E+01(ELE)
  005 12 HR 11 MIN 60.00 SEC  8.8448078E+01(RNG)  1.8787277E+02(AZI)  5.7359071E+01(ELE)
005  MAX EL AT  12  HR  12  MIN   10.67 SEC       ELEVATION =  79.53 DEGREES,   AZIMUTH = 261.09 DEGREES  52
  005 12 HR 12 MIN 60.00 SEC  2.2308304E+02(RNG)  3.4729586E+02(AZI)  1.8427180E+01(ELE)
  005 12 HR 13 MIN 60.00 SEC  4.6962138E+02(RNG)  3.4946770E+02(AZI)  5.8783741E+00(ELE)
  005 12 HR 14 MIN 60.00 SEC  7.2045819E+02(RNG)  3.5019139E+02(AZI)  5.8590576E-01(ELE)
005  SET    AT  12  HR  15  MIN    8.65 SEC       ELEVATION =   0.00 DEGREES,   AZIMUTH = 350.26 DEGREES  53
005  TOTAL VISIBILITY OF PASS =   5.71 MIN. OF STAT. =   5.71 MIN. OF VEH. =   5.71 MIN. PASS =  1  54

004  RISE   AT  12  HR  18  MIN   13.00 SEC       ELEVATION =   0.00 DEGREES,   AZIMUTH = 217.13 DEGREES
  004 12 HR 18 MIN 60.00 SEC  5.6327235E+02(RNG)  2.2792592E+02(AZI)  2.8602274E+00(ELE)
  004 12 HR 19 MIN 60.00 SEC  5.3398100E+02(RNG)  2.4905712E+02(AZI)  6.3954642E+00(ELE)
004  MAX EL AT  12  HR  20  MIN   52.02 SEC       ELEVATION =   7.79 DEGREES,   AZIMUTH = 273.67 DEGREES
  004 12 HR 20 MIN 60.00 SEC  5.0416915E+02(RNG)  2.7756269E+02(AZI)  7.7513384E+00(ELE)
  004 12 HR 21 MIN 60.00 SEC  5.8891714E+02(RNG)  3.0319002E+02(AZI)  5.7174502E+00(ELE)
  004 12 HR 22 MIN 60.00 SEC  7.4975958E+02(RNG)  3.2004020E+02(AZI)  2.4155542E+00(ELE)
004  SET    AT  12  HR  23  MIN   44.72 SEC       ELEVATION =   0.00 DEGREES,   AZIMUTH = 328.24 DEGREES
004  TOTAL VISIBILITY OF PASS =   5.53 MIN. OF STAT. =   5.53 MIN. OF VEH. =  11.24 MIN. PASS =  1

009  RISE   AT  15  HR  27  MIN   48.62 SEC       ELEVATION =   0.00 DEGREES,   AZIMUTH =  25.05 DEGREES
  009 15 HR 27 MIN 60.00 SEC  9.6357395E+02(RNG)  2.7676197E+01(AZI)  3.2563539E-01(ELE)
  009 15 HR 28 MIN 60.00 SEC  9.0680157E+02(RNG)  4.2787894E+01(AZI)  1.5396814E+00(ELE)
009  MAX EL AT  15  HR  29  MIN   36.13 SEC       ELEVATION =   1.75 DEGREES,   AZIMUTH =  52.44 DEGREES
  009 15 HR 29 MIN 60.00 SEC  9.1169530E+02(RNG)  5.8771469E+01(AZI)  1.6615190E+00(ELE)
  009 15 HR 30 MIN 60.00 SEC  9.7715671E+02(RNG)  7.3590588E+01(AZI)  6.8709926E-01(ELE)
009  SET    AT  15  HR  31  MIN   26.30 SEC       ELEVATION =   0.00 DEGREES,   AZIMUTH =  79.35 DEGREES
```

ITEM	DESCRIPTION	REFERENCE SECTION
48	Identification of the vehicle (Item 40) for which the program is simulating measurements (and its VEHID)	11.1.2
49	Date on which the data to follow applies	
50	Rise message. The time at which the vehicle becomes visible from a particular location is obtained by interpolation and is printed in hr, min, and sec (the elevation and local azimuth angles are printed in deg)	4 12
51	Simulated data showing the station; the time of day in hr, min, and sec; and the measurements generated, as indicated by the DATA GENERATION II card (Item 15). The time results from incrementing the START by Δt; both are found on the DATA GENERATION I card	12
52	Maximum elevation point. The time of the maximum elevation angle is obtained by interpolation and is printed, with the corresponding elevation and azimuth angles, in deg	
53	Set message. When the vehicle is no longer visible from a station, the time of invisibility is obtained by interpolation and is printed, with the corresponding elevation and azimuth angles, in deg	12
54	Duration message. After each pass, a message is printed giving the elapsed time of visibility for the pass in min and the current totals for station and vehicle. The number of the pass for the station is also printed	

********** VISIBILITY SUMMARY **********

STA-TION	NO. OF PASSES	TOTAL VISIBILITY TIME OF STATION	STA-TION	NO. OF PASSES	TOTAL VISIBILITY TIME OF STATION	STA-TION	NO. OF PASSES	TOTAL VISIBILITY TIME OF STATION
001	1	3.34	004	1	5.53	005	1	5.71
006	2	14.09	009	5	33.35			

TOTAL NUMBER OF PASSES WERE 10. TOTAL VISIBILITY TIME FOR THE VEHICLE WAS 67.03 MIN.

55

ITEM	DESCRIPTION	REFERENCE SECTION
55	Visibility Summary. After the data for the spans indicated by the DATA GENERATION I cards has been generated, a summary is printed. It includes the number of passes and the total visibility time for each station and vehicle	12

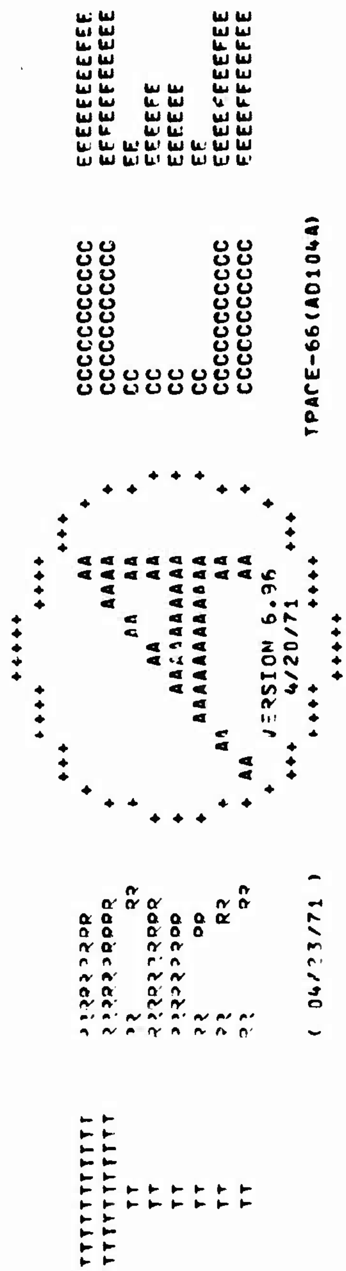
DY	HR	MN	001	004	005	006	003
16	12	5					
15	12	10			R		
16	12	15			S		
16	12	20		R			
16	12	25		S			
16	12	30					
16	12	35					
15	12	40					
16	12	45					
16	12	50					
16	12	55					
16	13	0					
15	13	5					
16	13	10					
16	13	15					
15	13	20					
16	13	25					
16	13	30					
16	13	35					
16	13	40					
16	13	45					
16	13	50					
16	13	55					
16	14	0					
16	14	5					
15	14	10					
16	14	15					
15	14	20					
16	14	25					
16	14	30					
15	14	35					
16	14	40					
15	14	45					
16	14	50					
15	14	55					
15	15	0					
16	15	5					
15	15	10					
15	15	15					
15	15	20					

CONT'D NEXT COLUMN

DY	HR	MN	001	004	005	006	009
16	15	25					
16	15	30					X
15	15	35					
16	15	40					
15	15	45					
16	15	50					
15	15	55					
16	16	0					
16	16	5					
16	16	10					
15	16	15					
16	16	20					
16	16	25					
16	16	30					
15	16	35					
16	16	40					
16	16	45					
16	16	50					
16	16	55					R
16	17	0					S
16	17	5					
16	17	10					
16	17	15					
16	17	20					
16	17	25					
16	17	30					
15	17	35					
16	17	40					
16	17	45					
16	17	50					
16	17	55					
15	18	0					
16	18	5					
16	18	1[illegible]					
16	18	15					
16	18	20					
16	18	25					R
16	18	30				R	S
16	18	35				+	
16	18	40				S	

ITEM	DESCRIPTION	REFERENCE SECTION
56	<u>Rise-set printer plot.</u> When RSPLT is input$\neq$0, the passes are given in a printer plot, using RSPLT as the scale. On the page shown, R means rise, S means set, X stands for rise and set in the same interval, and a + indicates continued visibility	2.4.1.1

C.3 TEST CASE B: ECI SINGLE-VEHICLE ORBIT DETERMINATION RUN (ITIN = 2)



```
MODEL DATA
DITIN 2                                                                                  CARD   1
IKSIG 1                  I2     2                 I3     3                               CARD   2
 SIGMA100                 2     .1                 3     .1                              CARD   3
INFORM1                  INTERM4                  MTERMS04,60                            CARD   4
D      02,00                    1082.76E-5                0                              CARD   5
D      03,00                    -2.693E-6                 0                              CARD   6  1
D      04,00                    -1.56E-6                  0                              CARD   7
D      02,02                    1.544E-6                  -0.765E-6                      CARD   8
 HO    2.0                HMIN 2.0                 HMAX 2.0                              CARD   9
IMAXIT2                                                                                  CARD  10
 GPLOT6.                  2     15.                                                      CARD  11
END                                                                                      CARD  12

***************************************** LUNAR GRAVITY MODEL *********************************************

GM = 6.8023265000E-05 ER**3/MIN**2  = 1.7313996407E+14 FT**3/SEC**2  = 4.9027777038E+12 M**3/SEC**2
        ***SPHERICAL MOON***

***************************************** EARTH GRAVITY MODEL *********************************************

GM = 5.5303935000E-03 ER**3/MIN**2  = 1.4076538841E+16 FT**3/SEC**2  = 3.9860318297E+14 M**3/SEC**2
        NO NORMALIZATION WITH    4 TERMS.
    N   M       CNM                SNM          **   N   M        CNM               SNM
    2   0    1.08276000E-03    0.               **   4   0   -1.56000000E-06    0.
    3   0   -2.69300000E-06    0.               **   2   2    1.54400000E-06   -7.65000000E-07

***************************************** PHYSICAL CONSTANTS **********************************************

GM(ER**3/MIN**2)    =  5.533393500E-03    OMEGE(RAD/MIN) =  4.375269100E-03  GMLAT(DEG)   =  7.830000000E+01
GMKM(KM**3/MIN**2)  =  0.                 OMEGA(RAD/MIN) =  4.375269100E-03  GMLNG(DEG)   =  2.910000000E+02
SGM(ER**3/MIN**2)   =  6.802326500E-05    OMEGL(RAD/MIN) =  0.               AM(ER)       =  2.725062770E-01
ERFT(FT/ER)         =  2.092573900E+07    ERKM(KM/ER)    =  6.378164900E+03  ERNM(NM/ER)  =  3.443933600E+03
FTKM(FT/KM)         =  3.280839900E+03    FTNM(FT/NM)    =  6.076115500E+03  AE(ER)       =  1.000000000E+00
GSUBO(FT/SEC**2)    =  3.217403000E+01    DGREE(DEG)     =  5.729577951E+01  SLT          =  2.320176300E+03
SKEP                =  1.000000000E-07    F              =  3.352329869E-03  PI           =  3.141592654E+00
```

ITEM	DESCRIPTION	REFERENCE SECTION
1	Card images of the input MODEL data. Those emphasized here are associated with a differential correction run, the others having been discussed earlier:	
	ITIN	2.1
	MAXIT	2.2.2
	GPLOT	2.2.1
	KSIG, SIGMA	2.2.6

```
******************************************* INPUT/OUTPUT CONVERSION FACTORS ******************************

DF(I/O-ER) =  2.09257380E+07   VF(I/O-ER/MIN) =  3.48762300E+05   AF(I/O-ER/MIN**2) =  5.81270500E+03

******************************************* INTEGRATION INPUTS ******************************************

 IFORM =   1              ICENT =   1             NSTEP =   2
 NPCMP =   0              IR    =   8             ER    = 1.00000000E-10
 HMIN  = 2.00000000E+00   HMAX  = 2.00000000E+00  HO    = 2.00000000E+00

******************************************* SPECIAL OPTIONS *********************************************

 TAPE2  =   0     TAPE7  =   0     TELEM  =   0     PTAPE  =   0     NPDOT  =   0
 PRHO   =   0     NODPR  =   0     CLASS  =   0     LEMSP  =   0     PTNS   =10000

******************************************* CRASH ALTITUDE **********************************************

 ECI CRASH ALTITUDE(FT) =   3.000000000E+05         MCI CRASH ALTITUDE(FT) =   3.000000000E+03

******************************************** STATION LOCATIONS *****************************************
STATION     SIG  REF  RA-REF  DATUM  TYPE       LATITUDE          LONGITUDE        HEIGHT        P    Q
                                                   X                  Y               Z
                                                 RADIUS            LATITUDE        LONGITUDE

  001        0    1     1      -0     -0    3.48000000E+01    2.39500000E+02   6.00000000E+02
  004        0    1     1      -0     -0    5.75000000E+01    2.07800000E+02   4.26000000E+02
  005        0    1     1      -0     -0    2.15000000E+01    2.01700000E+02   9.41000000E+02
  006        0    1     1      -0     -0    4.29000000E+01    2.88350000E+02   7.84000000E+02
  009        0    1     1      -0     -0    7.65000000E+01    2.91400000E+02   3.96000000E+02

ENTER SEGMENT 01 AT    87.3 SECONDS.  EXECUTION TIME FOR SEGMENT  0 WAS    87.3 CP SECS.,   256.8 PP SECS.

********************************************* VEHICLE DATA *********************************************

     IVEHID1                 IYEAR 1964            IMNTH 8                         CARD   1
     IDAY  16                 TZNF 0                HR   0                         CARD   2
      MIN  727                SEC  0               IICTYP2                         CARD   3
      IC   351.5              2    0                3     90.005                   CARD   4
      4    354.5              5    21351000         6     25856.                   CARD   5
      5    21360000                                                                CARD   6
     IIDRAG1                  DRAG .011                                            CARD   7
      DRAG .01                                                                     CARD   8
     MVPPAM04,60                                                                   CARD   9
     D     ALPHA                   1.                  0                           CARD  10
     D     DELTA                   1.                  0                           CARD  11
     D     BETA                    1.                  0                           CARD  12
     D     AZ                      1.                  0                           CARD  13
     D     R                       100000              0                           CARD  14
     D     V                       10                  0                           CARD  15
     D     DRAG                    .01                 0                           CARD  15
     TBCOIN4                                                                       CARD  17
     END                                                                           CARD  18
```

(2)

ITEM	DESCRIPTION	REFERENCE SECTION
2	<u>Card images of the input VEHICLE data.</u> The data emphasized here are those for a differential correction run, the others having been discussed earlier:	
	VPRAM	11.1.14
	BCDIN	11.2.1

** OBSERVATIONS **

STAPASS	YR	MO	DY	HR	MN	SECONDS	T	C	FIELD 1	FIELD 2	FIELD 3	MJD	ST	VEHID	MESSAGE
0050001	64	8	16	12	10	0.0100	1	0	3.39014234E+06	1.72209494E+02	2.76963411E+00	38623	43800.000	1	
0050001	64	8	16	12	11	0.0100	1	0	1.87384769E+06	1.73492976E+02	1.12076600E+01	38623	43860.000	1	
0050001	64	8	16	12	12	0.0100	1	0	5.37420728E+05	1.87872771E+02	5.73590711E+01	38623	43920.000	1	
0050001	64	8	16	12	13	0.0100	1	0	1.35547828E+06	3.47295855E+02	1.84271805E+01	38623	43980.000	1	
0050001	64	8	16	12	14	0.0100	1	0	2.85347371E+06	3.49467701E+02	5.87837413E+00	38623	44040.000	1	
0050001	64	8	16	12	15	0.0100	1	0	4.37758711E+06	3.50191395E+02	5.85905759E-01	38623	44100.000	1	
0040001	64	8	16	12	19	0.0100	1	0	4.03011936E+05	2.27925924E+02	2.86022743E+00	38623	44340.000	1	
0040001	64	8	16	12	20	0.0100	1	0	3.24453020E+06	2.49067115E+02	6.39546421E+00	38623	44400.000	1	
0040001	64	8	16	12	21	0.0100	1	0	3.06338996E+06	2.77562694E+02	7.75133841E+00	38623	44460.000	1	
0040001	64	8	16	12	22	0.0100	1	0	3.57832848E+06	3.03190025E+02	5.71745024E+00	38623	44520.000	1	
0040001	64	8	16	12	23	0.0100	1	0	4.55562572E+05	3.20040201E+02	2.41555425E+00	38623	44580.000	1	
0090001	64	8	16	15	28	0.0100	1	0	5.85478650E+06	2.76761965E+01	3.25635390E-01	38623	55680.000	1	
0090001	64	8	16	15	29	0.0100	1	0	5.50983100E+06	4.27878936E+01	1.53968145E+00	38623	55740.000	1	
0090001	64	8	16	15	30	0.0100	1	0	5.53956587E+06	5.87714689E+01	1.66151901E+00	38623	55800.000	1	
0090001	64	8	16	15	31	0.0100	1	0	5.93731692E+05	7.35905880E+01	6.87099257E-01	38623	55860.000	1	
0090002	64	8	16	15	57	0.0100	1	0	4.88932835E+06	3.17928740E+01	3.24975259E+00	38623	61020.000	1	
0090002	64	8	16	15	58	0.0100	1	0	4.13176431E+05	4.86814080E+01	6.40911377E+00	38623	61080.000	1	
0090002	64	8	16	15	59	0.0100	1	0	3.82064868E+05	7.06168216E+01	8.13172504E+00	38623	61140.000	1	
0090002	64	8	16	17	0	0.0100	1	0	4.06008072E+05	9.29956332E+01	7.28281979E+00	38623	61200.000	1	
0090002	64	8	16	17	1	0.0100	1	0	4.76570178E+06	1.10695971E+02	4.62626881E+00	38623	61260.000	1	
0090002	64	8	16	17	2	0.0100	1	0	5.76533468E+05	1.23037331E+02	1.49506641E+00	38623	61320.000	1	
0090003	64	8	16	18	25	0.0100	1	0	5.17267297E+05	2.36501782E+01	2.04242981E+00	38623	66300.000	1	
0090003	64	8	16	18	26	0.0100	1	0	3.84061613E+05	3.20603692E+01	7.36520897E+00	38623	66360.000	1	
0090003	64	8	16	18	27	0.0100	1	0	2.67930231E+06	4.87761502E+01	1.50081673E+01	38623	66420.000	1	
0090003	64	8	16	18	28	0.0100	1	0	2.01680569E+05	8.45829217E+01	2.30015375E+01	38623	66480.000	1	

3

ITEM	DESCRIPTION	REFERENCE SECTION
3	Observations. Each line represents one OBSERVATION card (or card image) containing the station pass identification, the last two digits of the year; the month, day, hour, minute, and second; the data set type; the covariance code; three measurements; the system time in seconds from midnight; the vehicle identification (which should be the same as the input VEHID); and any pertinent message If the observations are input by binary tape, nothing is printed at this point	11.2.1 15 11.1.2

```
     EPOCH                                          INITIAL CONDITIONS
   YR/MO/DAY          X,Y,Z,DX,DY,DZ          A,D,B,A,R,V             A,F,I,O,U,TAU          AF,AG,N,L,CHI,PSI
TZNE,HR,MIN,SEC       2.11253788414E+07      3.51500000000E+02       2.16730437072E+07      1.42983433809E-02
 1964/ 8/16          -3.15721902173E+05      0.                      1.44441834610E-02     -2.04739161253E-03
 0.                   0.                     9.00050000000E+01       9.55000000000E+01      6.73737489112E-02
 0.                  -3.68531052086E+02      3.54500000000E+02       3.51499999932E+02      3.51510035590E+02
 7.27000000000E+02   -2.45053350318E+03      2.13600000000E+07       3.51162206121E-01     -1.62725471159E-01
 0.                   2.57353640070E+04      2.58560000000E+04       6.38028929616E+02      1.08882155148E+00

NO PLANETARY PERTURBATIONS.

 ** ATMOSPHERE MODEL **   LOCKHEED                              TIME            CDA/W            W/CDA
                                                         7.27000000E+02    1.00000000E-02    1.00000000E+02
         D1  =  5.83000000E+00   D2 = -1.56840000E+01   FLUX =  0.


********************************************************************************************************


THESE ARE THE   7 PARAMETERS IN THE PARAM MATRIX.   7 ARE P PARAMETERS AND   0 ARE Q PARAMETERS

              NAME    P/Q   CURRENT VALUE             BOUND                SIGMA                 CONVERSION
    0001      ALPHA    P   3.51500000E+02       1.00000000E+00      0.                         5.72957795E+01
    0001      DELTA    P   0.                   1.00000000E+00      0.                         5.72957795E+01
    0001      BETA     P   9.00050000E+01       1.00000000E+00      0.                         5.72957795E+01   4
    0001      AZ       P   3.54500000E+02       1.00000000E+00      0.                         5.72957795E+01
    0001      R        P   2.13600000E+07       1.00000000E+05      0.                         2.09257380E+07
    0001      V        P   2.58560000E+04       1.00000000E+01      0.                         3.48762300E+05
    0001      DRAG     P   1.00000000E-02       1.00000000E-02      0.                         1.00000000E+00
ENTER SEGMENT 10 AT     88.2 SECONDS.  EXECUTION TIME FOR SEGMENT  1 WAS      .9 CP SECS.,      3.7 PP SECS.

          TRAJECTORY INTEGRATION FOR CASE   1

IVEP        0      ICENT        1      IDRAG        1     ALPHG    5.662162703E+00  CDAW 1.000000000E-02
JVEP        0      JNORM        1      IR           9     ALG-DEG  3.244180258E+02  ER   1.000000000E-10
MVEP        0      MAJOR        1      ISRP         0     TJDATE   2.438623500E+06  HMIN 2.000000000E+00
KVEP        7      NMASS        0      NEQS        24     TSTART   7.270000000E+02  HMAX 2.000000000E+00
LVEP        0      NT           4      RECMP        0     TSTOP    1.303000000E+03  HO   2.000000000E+00
ICENTX      1      JNORMX       0      NMASSX       0     FLIGHT   5.760000000E+02  NTX  0.
                                       NASA         0     SSTEP    1.000000000E+02  SORD 1.500000000E+00
```

ITEM	DESCRIPTION	REFERENCE SECTION
4	Parameter list indicating the quantities to be differentially corrected. Shown in tabular form are the name, P- or Q- parameter indicator, current value, input bound and sigma, and input/output conversion factor for each	2.1.5 5 11.1.14

```
                                   * PREDETERMINED EVENT TABLE *
TIME(MME)     TYPE        ASSOCIATED QUANTITIES
   727.0000 TZERO
  1303.0000 TSTOP

       ***  TRAJECTORY START

       * * * * * * * * * * * * * * * * * * * *    ECI   * * * * * * * * * * * * * * * * * * * *
SEG11 ENTRY TIME IS    88.39200

                T   =        727.000000          H   =             .250000        NSTEP   =             0

                     2.112537894141E+07         -3.685310520857E+02          -3.046630747846E+01
                    -3.157219021728E+06         -2.450633503183E+03           4.553085330712E+00
                     0.                          2.573696400698E+04          -9.269647818762E-04

  ALPHA              1.508758303287E-01          7.026658280390E-03          -7.831510004013E-04
                     1.009540444471E+00         -1.056682594666E-03          -5.241378230337E-03
                     0.                          0.                          -1.097983001491E-19

  DELTA             -0.                         -7.298456764874E-02           7.796797467675E-08
                    -0.                          1.090761671814E-02          -1.165239188860E-08
                     1.020752529732E+00         -6.469626029979E-06          -5.282946063561E-03

  BETA               0.                         -7.332203652761E-02           1.784801233243E-07
                     0.                          1.095867875294E-02          -2.667557346189E-08
                     0.                         -6.439841155098E-06           1.576498526150E-11

  AZ                 0.                          1.090761671814E-02          -2.679811016287E-08
                     0.                          7.298456764874E-02          -1.793040486660E-07
                     0.                          7.105664137797E-03          -6.686192638061E-09

  R                  9.890158633619E-01          0.                           1.025158804091E-02
                    -1.478034111296E-01          0.                          -1.545030064381E-03
                     0.                          0.                           8.273446422207E-05

  V                  0.                         -1.425321210109E-02           9.054266773255E-08
                     0.                         -9.478007051295E-02           6.029741570225E-07
                     0.                          9.953961945770E-01          -4.823534210103E-06

  DRAG               0.                          0.                           4.179048465007E-07
                     0.                          0.                           2.785612136380E-06
                     0.                          0.                          -1.796317601821E-05
```

ITEM	DESCRIPTION	REFERENCE SECTION
5	Variational equations $\partial \underline{r}/\partial p$, $\partial \dot{\underline{r}}/\partial p$, and $\partial \ddot{\underline{r}}/\partial p$ at epoch in internal units (er, min, rad). They are also printed at trajectory termination	

```
 FORCES        MAGNITUDE    X      Y      Z     ( EXTERNAL UNITS )      RADIAL        IN-TRACK     CROSS-TRACK
GEOPOTENTIAL  3.080465E+01-3.046633E+01 4.552923E+00 1.171816E-04-3.080465E+01 1.451160E-04 2.844807E-04
ATMOSPHERIC   1.056906E-03 2.329158E-05 1.619134E-04-1.044146E-03 9.154040E-08-1.055032E-03-6.290061E-05
TOTAL         3.080465E+01-3.046631E+01 4.553085E+00-9.269648E-04-3.080465E+01-9.099163E-04 2.215801E-04


*              STEP   DOUBLED           T   =    738.500000      H   =       .500000     NSTEP   =        45
*              STEP   DOUBLED           T   =    755.000000      H   =      1.000000     NSTEP   =        77
 NODE   T =    7.715583520317E+02   -2.176582988905E+07    3.262980232285E+06   -3.728897320902E-02
       DT =    1.000000000000E+00    3.537911412926E+02    2.373231048850E+03   -2.497833632549E+04
 NODE   T =    8.161292664234E+02    2.112218520803E+07   -3.175314737377E+06   -5.806079124474E-02
       DT =    1.000000000000E+00   -3.725292228421E+02   -2.453571977882E+03    2.573654906246E+04
 NODE   T =    8.605792101579E+02   -2.176031672252E+07    3.282341969531E+06   -8.851345013355E-02
       DT =    1.000000000000E+00    3.543221992190E+02    2.373711998480E+03   -2.498046437024E+04
 NODE   T =    9.052495437519E+02    2.111904558180E+07   -3.195441448025E+06   -1.089142397749E-01
       DT =    1.000000000000E+00   -3.764451039999E+02   -2.450006458669E+03    2.573605532061E+04
 NODE   T =    9.497914183655E+02   -2.175484343843E+07    3.301710920733E+06   -8.255062273435E-02
       DT =    1.000000000000E+00    3.547775373964E+02    2.379635130283E+03   -2.498254698085E+04
 NODE   T =    9.943614921564E+02    2.111597154074E+07   -3.214574854071E+06   -9.254330858625E-02
       DT =    1.000000000000E+00   -3.802618536119E+02   -2.448869768818E+03    2.573547481009E+04
 NODE   T =    1.038895652446E+03   -2.174940212352E+07    3.321068564613E+06   -3.594279181329E-02
       DT =    1.000000000000E+00    3.551846390693E+02    2.379099125130E+03   -2.498458774175E+04
 NODE   T =    1.083465655387E+03    2.111292961254E+07   -3.233696657703E+06   -2.891419523730E-02
       DT =    1.000000000000E+00   -3.840137775150E+02   -2.447423489211E+03    2.573484356653E+04
 NODE   T =    1.127992265585E+03   -2.174394390575E+07    3.340398114736E+06   -2.690685863653E-04
       DT =    1.000000000000E+00    3.556059319688E+02    2.378469760292E+03   -2.498603224190E+04
 NODE   T =    1.172562116777E+03    2.110985991176E+07   -3.252795144273E+06    4.289666407977E-02
       DT =    1.000000000000E+00   -3.877669615493E+02   -2.446106012514E+03    2.573422081092E+04
 NODE   T =    1.217081055379E+03   -2.173840712948E+07    3.359694127784E+06    2.373125585496E-02
       DT =    1.000000000000E+00    3.561029504792E+02    2.378167572974E+03   -2.498873582126E+04
 NODE   T =    1.261650421331E+03    2.110671159950E+07   -3.271871947250E+06    9.209807904329E-02
       DT =    1.000000000000E+00   -3.915807895113E+02   -2.445278165376E+03    2.573365461179E+04

               T   =      1303.000000         H   =        1.000000        NSTEP   =          625

                -2.128523953293E+07        -5.058055711570E+03         2.816695826715E+01
                 2.851378919969E+06         3.152604890545E+03        -3.773118593270E+00
                 4.702934850006E+06        -2.440058016364E+04        -6.204912227728E+00
```

ALPHA	-1.362342841631E-01	-9.088436656835E-03	6.484328686607E-04
	-1.017212811139E+00	-1.449786187164E-02	4.845908917901E-03
	3.071138860762E-04	7.194849538475E-06	-1.329310329866E-06
DELTA	-2.223629979567E-01	6.923775588704E-02	1.090259254687E-03
	3.486708901093E-02	-1.076005899338E-02	-1.648846072365E-04
	-1.029532701896E+00	-1.573248918873E-02	4.892409574229E-03
BETA	-5.950846829238E-01	2.127862353480E-01	6.238380127628E-03
	4.991370083584E-01	-2.670819115936E-02	-2.836879481173E-03
	-4.166931554943E+00	-6.517231652939E-02	1.904434799678E-02
AZ	2.073376608690E-02	-9.399691661485E-03	-9.550779774932E-05
	1.633887159981E-01	-7.026605970557E-02	-7.787934028991E-04
	-6.352352065773E-03	-7.178167747321E-03	2.945430374262E-05
R	2.257134554561E+01	-8.641203558093E+00	-1.469266634679E-01
	-1.577246371543E+01	1.141847806475E+00	8.041463864069E-02
	1.256600101207E+02	2.064367198044E+00	-5.882053793044E-01
V	2.921875566344E+02	-1.160413882949E+02	-2.075062236619E+00
	-2.102582031205E+02	1.524962195263E+01	1.093134873450E+00
	1.689179548620E+03	2.854457430755E+01	-7.873182542686E+00
DRAG	-1.788350615598E-01	8.611654347690E-02	1.902624164764E-03
	1.512410902734E-01	-1.119862927215E-02	-8.612346895912E-04
	-1.262437928033E+00	-2.316321440878E-02	5.765712037801E-03

FORCES	MAGNITUDE	X	Y	Z (EXTERNAL UNITS)	RADIAL	IN-TRACK	CROSS-TRACK
GEOPOTENTIAL	2.908805E+01	2.916696E+01	-3.773118E+00	-6.204916E+00	-2.908805E+01	-1.798890E-02	-1.910441E-03
ATMOSPHERIC	3.519705E-06	6.741910E-07	-6.553724E-07	3.391796E-06	-1.217397E-08	-3.513011E-06	2.166337E-07
TOTAL	2.908805E+01	2.916696E+01	-3.773119E+00	-6.204912E+00	-2.908805E+01	-1.799241E-02	-1.910224E-03

*** TRAJECTORY TERMINATION

*** THIS CASE TOOK 6.931 SECONDS TO INTEGRATE A SPAN OF 576.0000 MINUTES ***

*** FROM 727.000 TO 1303.000 MINUTES FROM MIDNIGHT OF EPOCH ***

ENTER SEGMENT 20 AT 95.3 SECONDS. EXECUTION TIME FOR SEGMENT 10 WAS 7.1 CP SECS., 11.2 PP SECS.

OBSERVATION RESIDUALS

STAPASS	YEAR	MO	DY	HR	MN	SEC							MJD	ST
0050001	1964	8	15	12	10	1.0000	7.2193E+02	RNG	-5.7748E-01	AZ	-1.5353E-01	EL	38623	43800.000
0050001	1964	8	15	12	11	1.0000	-1.3801E+03	RNG	-1.0051E+00	AZ	-2.6681E-01	EL	38623	43860.000
0050001	1964	8	15	12	12	1.0000	-1.2039E+04	RNG	-3.1996E+00	AZ	2.7212E-01	EL	38623	43920.000
0050001	1964	8	15	12	13	1.0000	-6.9736E+03	RNG	1.2433E+00	AZ	-2.9075E-01	EL	38623	43980.000
0050001	1964	8	15	12	14	1.0000	-3.8206E+03	RNG	5.5980E-01	AZ	-1.7049E-01	EL	38623	44040.000
0050001	1964	8	15	12	15	1.0000	-2.5545E+03	RNG	3.4055E-01	AZ	-1.1805E-01	EL	38623	44100.000
0040001	1964	8	15	12	19	1.0000	-1.7570E+04	RNG	-1.1783E-01	AZ	-9.4941E-02	EL	38623	44340.000
0040001	1964	8	15	12	20	1.0000	-1.7816E+04	RNG	-8.9713E-03	AZ	-1.1780E-01	EL	38623	44400.000
0040001	1964	8	15	12	21	1.0000	-1.3983E+04	RNG	1.4065E-01	AZ	-1.4985E-01	EL	38623	44460.000
0040001	1964	8	15	12	22	1.0000	-7.2055E+03	RNG	1.7872E-01	AZ	-1.6847E-01	EL	38623	44520.000
0040001	1964	8	15	12	23	1.0000	-1.4351E+03	RNG	1.3477E-01	AZ	-1.5095E-01	EL	38623	44580.000
0090001	1964	8	15	15	28	1.0000	-1.2982E+05	RNG	3.4447E+00	AZ	2.2904E-01	EL	38623	55680.000
0090001	1964	8	15	15	29	1.0000	-4.0641E+04	RNG	3.9272E+00	AZ	-2.7394E-02	EL	38623	55740.000
0090001	1964	8	15	15	30	1.0000	5.8452E+04	RNG	7.9207E+00	AZ	-3.4042E-01	EL	38623	55800.000
0090001	1964	8	15	15	31	1.0000	1.4832E+05	RNG	7.4197E+00	AZ	-5.9195E-01	EL	38623	55860.000
0090002	1964	8	15	16	57	1.0000	-3.5218E+05	RNG	4.9318E+00	AZ	1.0259E+00	EL	38623	61020.000
0090002	1964	8	15	16	58	1.0000	-2.2774E+05	RNG	7.0022E+00	AZ	7.8108E-01	EL	38623	61080.000
0090002	1964	8	15	16	59	1.0000	-3.7413E+04	RNG	8.5014E+00	AZ	-2.1927E-02	EL	38623	61140.000
0090002	1964	8	15	17	0	1.0000	1.7160E+05	RNG	7.7989E+00	AZ	-1.0276E+00	EL	38623	61200.000
0090002	1964	8	15	17	1	1.0000	3.2728E+05	RNG	5.5789E+00	AZ	-1.4818E+00	EL	38623	61260.000
0090002	1964	8	15	17	2	1.0000	4.1849E+05	RNG	3.7989E+00	AZ	-1.4921E+00	EL	38623	61320.000
0090003	1964	8	15	18	25	1.0000	-6.8546E+05	RNG	2.8032E+00	AZ	1.9257E+00	EL	38623	66300.000
0090003	1964	8	15	18	26	1.0000	-6.4581E+05	RNG	4.9128E+00	AZ	2.5937E+00	EL	38623	66360.000
0090003	1964	8	15	18	27	1.0000	-5.3708E+05	RNG	9.3494E+00	AZ	3.7369E+00	EL	38623	66420.000
0090003	1964	8	15	18	28	1.0000	-3.2054E+05	RNG	1.9821E+01	AZ	2.6701E+00	EL	38623	66480.000
0090003	1964	8	15	18	29	1.0000	2.2744E+05	RNG	1.7870E+01	AZ	-4.3390E+00	EL	38623	66540.000
0090003	1964	8	15	18	30	1.0000	5.7607E+05	RNG	8.3089E+00	AZ	-4.4874E+00	EL	38623	66600.000
0090003	1964	8	15	18	31	1.0000	6.5874E+05	RNG	3.9667E+00	AZ	-3.1298E+00	EL	38623	66660.000
0090003	1964	8	15	18	32	1.0000	7.[illegible]64E+05	RNG	2.1718E+00	AZ	-2.3600E+00	EL	38623	66720.000
0060001	1964	8	15	18	33	1.0000	-7.1[illegible]59E+05	RNG	1.8713E+00	AZ	1.9399E+00	EL	38623	66780.000
0060001	1964	8	15	18	34	1.0000	-7.0566E+05	RNG	3.0210E+00	AZ	2.6756E+00	EL	38623	66840.000
0060001	1964	8	15	18	35	1.0000	-6.6270E+05	RNG	5.8862E+00	AZ	4.4637E+00	EL	38623	66900.000
0060001	1964	8	15	18	36	1.0000	-4.3949E+05	RNG	1.5855E+01	AZ	8.5635E+00	EL	38623	66960.000
0060001	1964	8	15	18	37	1.0000	3.2051E+04	RNG	2.9397E+01	AZ	-4.7912E+00	EL	38623	67020.000
0060001	1964	8	15	18	38	1.0000	5.8605E+05	RNG	9.2096E+00	AZ	-1.0165E+01	EL	38623	67080.000

6

CONT'D

ITEM	DESCRIPTION	REFERENCE SECTION
6	<u>Observation residuals.</u> Each line corresponds to one input observation set or card and contains the station-pass identification in year, month, day, hour, minute, and second; three pairs of measurement residuals and identification; the modified Julian date; and the system time in seconds from midnight The residuals are the unnormalized differences between the input measurements (modified by bias and/or refraction corrections) and the corresponding values for the same measurement types computed from the integrated trajectory position at the observation time. The observation names are abbreviated as follows:	

RNG	Range	CM3	Three-way cumulative doppler
AZ	Azimuth	DOP	Doppler
EL	Elevation	TWD	Two-way doppler
TRA	Topocentric right ascension	SRR	SGLS range rate
TD	Topocentric declination	AX	X-antenna
THA	Topocentric hour angle	AY	Y-antenna
GRA	Geocentric right ascension	CC3	JPL two- or three-way doppler
GD	Geocentric declination	TNT	Tranet doppler
U	u	GCR	Geoceiver range difference
V	v	V2	Vehicle-vehicle range
H	Height	V2D	Vehicle-vehicle range rate
X	$\hat{x}$	S2	Station-vehicle-vehicle range
Y	$\hat{y}$	S2D	Station-vehicle-vehicle range rate
Z	$\hat{z}$	S3	Station-vehicle-vehicle-vehicle range
P	P		
Q	Q	S3D	Station-vehicle-vehicle-vehicle range rate
RD	Range rate		
PD	P rate	V3	Vehicle-vehicle-vehicle range
QD	Q rate	TDA	Time difference of arrival
ACC	Accelerometer	TØA	Time of arrival
CM1	One-way cumulative doppler	N	Time-of-arrival counter

0060001	1964	8	16	18	39	1.0000	7.0286E+05	RNG	2.9163E+00	AZ	-5.2355E+00	EL	38623	67140.000
0060001	1964	8	16	18	40	1.0000	7.3429E+05	RNG	1.1680E+00	AZ	-3.3119E+00	EL	38623	67200.000
0060001	1964	8	16	18	41	1.0000	7.4494E+05	RNG	5.2410E-01	AZ	-2.4719E+00	EL	38623	67260.000
0090004	1964	8	16	19	54	1.0000	-9.2242E+05	RNG	3.9277E-02	AZ	3.1053E+00	EL	38623	71640.000
0090004	1964	8	16	19	55	1.0000	-9.1014E+05	RNG	-5.0427E-02	AZ	5.2478E+00	EL	38623	71700.000
0090004	1964	8	16	19	56	1.0000	-8.4236E+05	RNG	-8.0807E-01	AZ	1.4012E+01	EL	38623	71760.000
0090004	1964	8	16	19	57	1.0000	-2.1213E+05	RNG	-9.8093E+01	AZ	2.1983E+01	EL	38623	71820.000
0090004	1964	8	16	19	58	1.0000	7.5414E+05	RNG	-3.4655E+00	AZ	-2.1948E+01	EL	38623	71880.000
0090004	1964	8	16	19	59	1.0000	8.8836E+05	RNG	-1.2950E+00	AZ	-7.2931E+00	EL	38623	71940.000
0090004	1964	8	16	20	0	1.0000	9.1358E+05	RNG	-7.5093E-01	AZ	-4.0585E+00	EL	38623	72000.000
0090004	1964	8	16	20	1	1.0000	9.2012E+05	RNG	-5.3110E-01	AZ	-2.9022E+00	EL	38623	72060.000
0060002	1964	8	16	20	2	1.0000	-6.5857E+05	RNG	-6.0141E+00	AZ	1.6043E+00	EL	38623	72120.000
0060002	1964	8	16	20	3	1.0000	-5.1788E+05	RNG	-8.1363E+00	AZ	1.4180E+00	EL	38623	721[illegible].000
0060002	1964	8	16	20	4	1.0000	-3.0667E+05	RNG	-1.0234E+01	AZ	8.5309E-01	EL	38623	72240.000
0060002	1964	8	16	20	5	1.0000	-4.0119E+04	RNG	-1.1161E+01	AZ	-1.0546E-01	EL	38623	72300.000
0060002	1964	8	16	20	6	1.0000	2.2402E+05	RNG	-1.0283E+01	AZ	-1.0364E+00	EL	38623	72360.000
0060002	1964	8	16	20	7	1.0000	4.3282E+05	RNG	-8.3794E+00	AZ	-1.5689E+00	EL	38623	72420.000
0090005	1964	8	16	21	22	1.0000	-1.0705E+06	RNG	-3.6137E+00	AZ	3.1091E+00	EL	38623	76920.000
0090005	1964	8	16	21	23	1.0000	-1.0197E+06	RNG	-6.6744E+00	AZ	4.3194E+00	EL	38623	76980.000
0090005	1964	8	16	21	24	1.0000	-8.6449E+05	RNG	-1.4787E+01	AZ	6.6335E+00	EL	38623	77040.000
0090005	1964	8	16	21	25	1.0000	-3.6017E+05	RNG	-3.2194E+01	AZ	5.1185E+00	EL	38623	77100.000
0090005	1964	8	16	21	26	1.0000	4.6302E+05	RNG	-2.7804E+01	AZ	-6.4851E+00	EL	38623	77160.000
0090005	1964	8	16	21	27	1.0000	8.7611E+05	RNG	-1.2828E+01	AZ	-6.4116E+00	EL	38623	77220.000
0090005	1964	8	16	21	28	1.0000	1.0081E+06	RNG	-6.4230E+00	AZ	-4.3884E+00	EL	38623	77280.000
0010001	1964	8	16	21	33	1.0000	-1.0512E+06	RNG	3.8996E+00	AZ	2.7464E+00	EL	38623	77580.000
0010001	1964	8	16	21	34	1.0000	-1.0094E+06	RNG	6.0810E+00	AZ	3.4880E+00	EL	38623	77640.000
0010001	1964	8	16	21	35	1.0000	-9.0848E+05	RNG	1.0721E+01	AZ	4.8261E+00	EL	38623	77700.000
0010001	1964	8	16	21	36	1.0000	-6.3781E+05	RNG	2.1169E+01	AZ	5.9965E+00	EL	38623	77760.000
0010001	1964	8	16	21	37	1.0000	-1.9800E+03	RNG	3.1735E+01	AZ	-7.3969E-01	EL	38623	77820.000
0010001	1964	8	16	21	38	1.0000	6.7253E+05	RNG	2.0250E+01	AZ	-8.5494E+00	EL	38623	77880.000
0010001	1964	8	16	21	39	1.0000	9.6476E+05	RNG	9.2024E+00	AZ	-6.7311E+00	EL	38623	77940.000
0010001	1964	8	16	21	40	1.0000	1.0652E+06	RNG	4.5307E+00	AZ	-4.7156E+00	EL	38623	78000.000

TOTAL EDIT SUMMARY

STA	N	TYP	RMS	RMS/SIG	MEAN	N	TYP	RMS	RMS/SIG	MEAN	N	TYP	RMS	RMS/SIG	MEAN
001	8	RNG	8.6E+05	8.6E+03	-1.1E+05	8	AZ	1.6E+01	1.6E+02	1.3E+01	8	EL	5.2E+00	5.2E+01	-4.6E-01
004	5	RNG	1.3E+04	1.3E+02	-1.2E+04	5	AZ	1.3E-01	1.3E+00	6.5E-02	5	EL	1.4E-01	1.4E+00	-1.4E-01
005	6	RNG	6.0E+03	6.0E+01	-4.3E+03	6	AZ	1.5E+00	1.5E+01	-4.4E-01	6	EL	2.2E-01	2.2E+00	-1.2E-01
006	15	RNG	5.6E+05	5.6E+03	-4.0E+04	15	AZ	1.1E+01	1.1E+02	1.0E+00	15	EL	4.3E+00	4.3E+01	-4.8E-01
009	33	RNG	6.4E+05	6.4E+03	3.4E+03	33	AZ	2.0E+01	2.0E+02	-2.6E+00	33	EL	6.9E+00	6.9E+01	1.1E-01

ENTER SEGMENT 30 AT 97.1 SECONDS. EXECUTION TIME FOR SEGMENT 20 WAS 1.8 CP SECS., 9.8 PP SECS.

ITEM	DESCRIPTION	REFERENCE SECTION
7	Edit summary. The RMS of the residuals for each measurement type from each station is computed by the residuals editor. Included in the printout are the station identification, the number of residuals included in the RMS (i.e., the total number for that station and type minus the number deleted by the editor on this iteration), the RMS, the RMS divided by the input weighting sigma, and the mean value of the residuals. The measurement type indicators are the same as those used for residuals (Item 6) Because of storage constraints, the residuals editor accumulates residuals and makes editing checks only for the first 6 measurement types for the first 30 stations	2.2.4

ITERATION NUMBER 1 8
201 OBSERVATIONS WERE USED IN THIS SOLUTION 9
CURRENT SOLUTION IS BEST SO FAR 10
CURRENT SOLUTION IS

NAME		CURRENT VALUE	CORRECTION	BOUND	NEW VALUE	SIGMA
0001	ALPHA	3.51499999999996E+02	3.29208724E-01	1.00000000E+00	3.51829208723992E+02	1.25190034E-04
0001	DELTA	0.	1.13160500E-01	1.00000000E+00	1.13160499953416E-01	2.10518024E-04
0001	BETA	9.00049999999992E+01	-2.26835100E-01	1.00000000E+00	8.97781648996747E+01	9.1989685[illegible]E-05
0001	AZ	3.54499999999996E+02	6.64006620E-02	1.00000000E+00	3.54566400661983E+02	7.3125296[illegible]E-05
0001	R	2.13599999999998E+07	-1.23030829E+04	1.00000000E+05	2.13476969170890E+07	5.73271117E+01
0001	V	2.58559999999998E+04	-5.17544231E-01	1.00000000E+03	2.58554824557692E+04	7.08926739E-02
0001	DRAG	1.00000000000000E-02	-8.77565717E-03	1.00000000E-02	1.22434282701928E-03	8.45819835E-06

11

CORRECTIONS HITTING BOUNDS. 5 ITERATIONS USED IN FINDING Z 12

RMS FOR THIS SOLUTION = 3.4716713914E+03 13

PREDICTED RMS FOR NEXT SOLUTION = 4.8322106976E+02 14

XT((ATA)X) = 2.37501378E+09 XT(ATB) = 2.37561893E+09 RATIO = 9.99745266E-01 15

CORRELATION MATRIX DETERMINANT = 7.26217525E-07 16

0001 ALPHA	0001 DELTA	0001 BETA	0001 AZ	0001 R	0001 V	0001 DRAG
1.000000000						
.177635916	1.000000000					
-.122165667	-.533863245	1.000000000				
.460579679	.205133632	-.234238491	1.000000000			
.169899883	.850313741	-.615787104	.161605940	1.000000000		
-.167882861	-.845366506	.632669139	-.162982940	-.999457483	1.000000000	
.165362253	.449753863	.058309304	.072642556	.406561987	-.378328785	1.000000000

17

ENTER SEGMENT 40 AT 97.3 SECONDS. EXECUTION TIME FOR SEGMENT 30 WAS .2 CP SECS., 2.6 PP SECS.

ITEM	DESCRIPTION	REFERENCE SECTION
8	Iteration number. TRACE makes the differential correction, or orbit determination, by computing a series of differential corrections of the parameters selected by the user. The iteration number is advanced each time a set is recomputed and indicates the number of times the orbit determination algorithm has been performed	2.2.2
9	Observation count. The number of individual measurements included in the current (best) least squares computation is indicated	
10	Convergence indicator. If the weighted RMS for all residuals is less than that for any previous iteration, the correction process is converging, and the message shown is printed. If the current RMS is greater than the smallest RMS obtained on previous iterations, the message CURRENT ITERATION IS NOT GOOD (SOS X.XXXXXXXXE±XX) is printed at this point.	2.2.2
11	The current solution is shown, one parameter per line, starting with the name (Item 4). If the iteration has been successful (i.e., if the overall RMS has been lowered), the current value is the parameter value used in the integration, partial derivatives, and residuals computations just completed. For the first iteration, it is the input value of the parameter. If an iteration is bad, the value produced for the lowest RMS is recovered from memory and is printed as the current value The correction, the solution of the system of normal equations associated with the current (best) iteration, is also shown on the line, as is the bound, the current value of the number used to limit the correction size. In general, these bounds are automatically increased on a good iteration and decreased on a bad one. The last two columns contain the new value (correct value plus correction) to be used for the next iteration and the a priori sigma for the parameter	2.2.3
12	Indications that the correction sizes have been controlled by solving the system so that the constraint of the bounds is satisfied. The number of iterations to determine the Lagrange multiplier z is also shown. If the normal equations were solved without applying the bounds, nothing would be printed at this point	
13	RMS. The quantity to be minimized in the differential correction process is the RMS of the normalized residuals for the current iteration	
14	Predicted RMS. If the fitting process is converging in a completely linear manner, this will be the RMS on the next iteration; it may be compared with the current RMS (Item 13) to measure the degree to which the process has already converged	
15	The equation being solved is $A^TWA\Delta P = A^TWB$; therefore, the solution should also satisfy $\Delta P^T A^TWA\Delta P = \Delta P^T A^TWB$. By comparing the ratio of the two sides of the preceding equation to 1, an estimation of the quality of the matrix inversion may be obtained and, implicitly, of the normal matrix conditioning. This comparison is valid only when bounds are not hit	
16	Determinant of the correlation matrix	
17	Correlation matrix, the correlation coefficients for the parameter set. These values are computed directly from the covariance matrix (i.e., the inverse normal matrix). Row sequence is the same as column sequence	

**** ORBITAL ELEMENTS FOR VEHICLE 1 FOR ITERATION 2. ****

YEAR/MO/DY	X	ALPHA	A	AF	MEAN ANOMOLY	APOGEE RADIUS
HR/MIN	Y	DELTA	E	AG	ECCENTRC ANOM	APOGEE HEIGHT
SECONDS	Z	BETA	I	N	TRUE ANOMOLY	PERIGEE RADIUS
LATITUDE	XDOT	AZIMUTH	O	L	KEPLERIAN PER	PERIGEE HEIGHT
LONGITUDE	YDOT	RADIUS	U	CHI	ANOMALY PER	O-DOT
HEIGHT	ZDOT	VELOCITY	TAU	PSI	NODAL PERIOD	U-DOT
1964/ 8/16	21130951.239	351.829208313	21646835.097	.0131185024774	15.42829991	3613.73818
12/ 7	-3034021.391	.113160500	.01435106322	-.0058187548808	15.65011327	170.65518
0.0000000	42162.172	89.778164900	95.433588709	.0674961437126	15.87348122	3511.48367
.1139230	-293.1917405	354.566400251	351.839972422	351.508462446	88.8339674	68.40067
205.1635851	-2430.4413689	21347696.917	344.240189981	-.15608012581	89.0346349	.8384569822
69.4456	25739.2581881	25855.4924559	723.1903256	1.08849975398	08.9701739	-4.2288007596

(18)

ENTER SEGMENT 10 AT 97.5 SECONDS. EXECUTION TIME FOR SEGMENT 40 WAS .2 CP SECS., 8.4 PP SECS.

TRAJECTORY INTEGRATION FOR CASE 1

IVEP	0	ICENT	1	IDRAG	1	ALPHG	5.662162703E+00	CDAW	1.224342827E-03
JVEP	0	JNORM	1	IR	3	ALG-DEG	3.244180258E+02	ER	1.000000000E-10
MVEP	0	MAJOR	1	ISRP	0	TJDATE	2.438623500E+06	HMIN	2.000000000E+00
KVEP	7	NMASS	0	NEQS	24	TSTART	7.270000000E+02	HMAX	2.000000000E+00
LVEP	0	NT	4	RECMP	0	TSTOP	1.303000000E+03	HO	2.000000000E+00
ICENTX	1	JNORMX	0	NMASSX	0	FLIGHT	5.760000000E+02	NTX	0.
				NASA	0	SSTEP	1.000000000E+02	SORO	1.500000000E+00

* PREDETERMINED EVENT TABLE *

TIME(MME)	TYPE	ASSOCIATED QUANTITIES
727.0000	TZERO	
1303.0000	TSTOP	

*** TRAJECTORY START

* ECI *

SEG11 ENTRY TIME IS 97.69200

T = 727.000000	H = .250000	NSTEP = 0
2.113035123784E+07	-2.991917404612E+02	-3.052702432160E+01
-3.034021390711E+06	-2.430441368898E+03	4.382852174980E+00
4.216217155988E+04	2.573925818813E+04	-5.077158946111E-02

ITEM	DESCRIPTION	REFERENCE SECTION
18	Initial conditions and characteristics for the next iteration are fully explained in the epoch print (Item 42) of the previous case	

```
ALPHA        1.449839349170E-01        6.968761729401E-03       -7.538634032513E-04
             1.009816738373E+00       -8.578672077264E-04       -5.251821922072E-03
             0.                        0.                        5.072796977429E-10

DELTA       -1.994334437437E-03       -7.305254656714E-02        1.013851645742E-05
             2.863538731332E-04        1.048902088865E-02       -1.455639633366E-06
             1.020162539830E+00        1.412718155228E-04       -5.288997732691E-03

BETA         0.                       -7.338613986721E-02        2.910517841854E-08
             0.                        1.050946047628E-02       -4.167985675079E-09
             0.                        1.393241626287E-04       -5.589291141101E-11

AZ           0.                        1.047523697341E-02       -4.189457598863E-09
             0.                        7.305409839516E-02       -2.924014878256E-08
             0.                        7.019930643232E-03       -1.055755549733E-09

R            9.898458823081E-01        0.                        1.027953859891E-02
            -1.421240615554E-01        0.                       -1.478110678485E-03
             1.975022023389E-03        0.                        3.530004569560E-05

V            0.                       -1.157169435817E-02        1.249910573710E-08
             0.                       -9.400100628776E-02        9.763856698858E-08
             0.                        9.955048501673E-01       -7.860128671986E-07

DRAG         0.                        0.                        4.833824156621E-07
             0.                        0.                        3.688586245117E-06
             0.                        0.                       -2.390669173616E-05

 FORCES      MAGNITUDE      X          Y         Z      ( EXTERNAL UNITS )      RADIAL       IN-TRACK      CROSS-TRACK
GEOPOTENTIAL 3.084011E+01-3.052703E+01 4.382825E+00-6.060145E-02-3.084011E+01 3.353302E-04 2.680478E-04
ATMOSPHERIC  1.721854E-04 3.440109E-06 2.625072E-05-1.701378E-04-6.617043E-07-1.718791E-04-1.024360E-05
TOTAL        3.084011E+01-3.052702E+01 4.382852E+00-6.077159E-02-3.084011E+01 1.634510E-04 2.578042E-04

*            STEP    DOUBLED          T  =    737.000000      H  =         .500000     NSTEP  =        39
*            STEP    DOUBLED          T  =    752.500000      H  =        1.000000     NSTEP  =        69
  NODE   T = 7.716776901297E+02   -2.174592635526E+07    3.128044651412E+06    8.185382931127E-02
        DT = 1.000000000000E+00    4.363066536235E+02    2.341032215047E+03   -2.501100242896E+04
  NODE   T = 8.159439381529E+02    2.112807778157E+07   -3.048921452957E+06   -8.866507996913E-03
        DT = 1.000000000000E+00   -2.531640783088E+02   -2.437807435119E+03    2.573986349851E+04
```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NODE	T =	8.606439784949E+02	-2.174307672354E+07	3.147574109853E+06	6.346098681070E-02
	DT =	1.000000000000E+00	4.367489585581E+02	2.341259412302E+03	-2.501088063800E+04
NODE	T =	9.049131125587E+02	2.112480922144E+07	-3.067826874256E+06	-3.145012691736E-02
	DT =	1.000000000000E+00	-2.570751312713E+02	-2.437496916786E+03	2.574034521037E+04
NODE	T =	9.496085345421E+02	-2.174027955617E+07	3.167115480898E+06	4.731287274225E-02
	DT =	1.000000000000E+00	4.371065454945E+02	2.340929513896E+03	-2.501069558271E+04
NODE	T =	9.938809223148E+02	2.112160903266E+07	-3.086737009815E+06	-5.239012997875E-02
	DT =	1.000000000000E+00	-2.609021288274E+02	-2.436611139646E+03	2.574074086916E+04
NODE	T =	1.038572072318E+03	-2.173752250007E+07	3.186650039577E+06	2.199408100714E-02
	DT =	1.000000000000E+00	4.374054250921E+02	2.340136166310E+03	-2.501046135307E+04
NODE	T =	1.082847949403E+03	2.111844585457E+07	-3.105634339711E+06	-6.394101090157E-02
	DT =	1.000000000000E+00	-2.646769896776E+02	-2.435406138572E+03	2.574108312266E+04
NODE	T =	1.127534984272E+03	-2.173475444553E+07	3.206160942905E+06	6.063245481935E-03
	DT =	1.000000000000E+00	4.377056630312E+02	2.339242337792E+03	-2.501022825244E+04
NODE	T =	1.171814316422E+03	2.111526079807E+07	-3.124507502435E+06	-8.286088097144E-02
	DT =	1.000000000000E+00	-2.684624881963E+02	-2.434319116268E+03	2.574143064371E+04
NODE	T =	1.216497109383E+03	-2.173191504376E+07	3.225642388976E+06	1.370241885715E-06
	DT =	1.000000000000E+00	4.380669398760E+02	2.338670267869E+03	-2.501004494494E+04
NODE	T =	1.260779610736E+03	2.111200155498E+07	-3.143357829477E+06	-9.022722714296E-02
	DT =	1.000000000000E+00	-2.723159956769E+02	-2.433715458936E+03	2.574183413167E+04

	T = 1303.500000	H = 1.000000	NSTEP = 620
	-2.158139373011E+07	-2.936560141066E+03	2.857982966037E+01
	2.941602320333E+06	2.820751815171E+03	-3.895256328281E+00
	2.928995390395E+06	-2.478242573033E+04	-3.867091391020E+00
ALPHA	-1.405793253351E-01	-8.112355054985E-03	6.694580358838E-04
	-1.031332567536E+00	-8.414333182920E-03	4.916945383847E-03
	3.631775052101E-04	5.226738622887E-06	-1.632595318533E-06
DELTA	-1.387830212820E-01	7.056569936537E-02	6.574985670973E-04
	2.129793488308E-02	-1.054634674355E-02	-1.009645314532E-04
	-1.047049174250E+00	-9.559078210560E-03	4.977361441106E-03
BETA	-3.140554057470E-01	1.967200090466E-01	3.662521752306E-03
	4.237426207680E-01	-2.575880859943E-02	-2.315171961345E-03
	-3.917037913912E+00	-3.740467308669E-02	1.832581016705E-02
AZ	9.128502328766E-03	-8.972395236228E-03	-3.906947413612E-05
	8.055012853788E-02	-7.104564900142E-02	-3.846046274812E-04
	-1.608938734680E-02	-7.046327340826E-03	7.587327516339E-05

```
R               1.144856139165E+01       -8.503537251800E+00       -1.009066847643E-01
               -1.359557914992E+01        1.144803978440E+00        7.112715583158E-02
                1.233937145524E+02        1.296812247239E+00       -5.802836860332E-01

V               1.452254490322E+02       -1.176498466858E+02       -1.520343930412E+00
               -1.862350275205E+02        1.574794788511E+01        1.000672309522E+00
                1.708331085917E+03        1.887705432857E+01       -8.008410938828E+00

DRAG           -9.783352270257E-02        1.255965284188E-01        2.186118776008E-03
                1.920342548582E-01       -1.663381409215E-02       -1.149855285102E-03
               -1.842454554114E+00       -2.315265667377E-02        8.525382604848E-03

  FORCES       MAGNITUDE     X       Y       Z    ( EXTERNAL UNITS )      RADIAL       IN-TRACK     CROSS-TRACK
GEOPOTENTIAL  2.910213E+01 2.857983E+01-3.895257E+00-3.867092E+00-2.910213E+01-1.142734E-02-1.238510E-03
ATMOSPHERIC   4.495445E-07 4.833679E-08-7.803580E-08 4.400730E-07 7.376945E-10-4.486663E-07 2.807590E-08
TOTAL         2.910213E+01 2.857983E+01-3.895257E+00-3.867092E+00-2.910213E+01-1.142779E-02-1.238482E-03


      ***  TRAJECTORY TERMINATION


      ***  THIS CASE TOOK      6.885  SECONDS TO INTEGRATE A SPAN OF    576.5000  MINUTES  ***

          ***  FROM        727.000  TO       1303.500  MINUTES FROM MIDNIGHT OF EPOCH  ***

ENTER SEGMENT 20 AT    104.5 SECONDS.  EXECUTION TIME FOR SEGMENT 10 WAS     7.0 CP SECS.,    11.3 PP SECS.

OBSERVATION RESIDUALS

STAPASS  YEAR MO DY HR MN  SEC                                                                   MJD       ST
0050001  1964  8 16 12 10  0.0000  2.2688E+04   RNG    1.6215E+00   AZ   -3.3328E-01   EL   38623 43800.000
0050001  1964  8 16 12 11  0.0000  1.7605E+04   RNG    2.9479E+00   AZ   -8.0831E-01   EL   38623 43860.000
0050001  1964  8 16 12 12  0.0000 -6.9197E+03   RNG    9.3419E+00   AZ   -4.2212E+00   EL   38623 43920.000
0050001  1964  8 16 12 13  0.0000 -2.2796E+04   RNG   -4.0375E+00   AZ   -1.0205E+00   EL   38623 43980.000
0050001  1964  8 16 12 14  0.0000 -1.5651E+04   RNG   -1.9082E+00   AZ   -6.6809E-01   EL   38623 44040.000
0050001  1964  8 16 12 15  0.0000 -1.1783E+04   RNG   -1.2258E+00   AZ   -5.1925E-01   EL   38623 44100.000
0040001  1964  8 16 12 19  0.0000  3.0133E+04   RNG    1.0505E+00   AZ   -9.6596E-01   EL   38623 44340.000
0040001  1964  8 16 12 20  0.0000  4.3115E+04   RNG    1.0582E+00   AZ   -1.3543E+00   EL   38623 44400.000
0040001  1964  8 16 12 21  0.0000  5.8001E+04   RNG    6.1916E-01   AZ   -1.6029E+00   EL   38623 44460.000
```

0040001	1964	8	16	12	22	0.0000	6.5667E+04	RNG	9.8096E-02	AZ	-1.4357E+03	EL	38623	44520.000
0040001	1964	8	15	12	23	0.0000	6.8526E+04	RNG	-1.0875E-01	AZ	-1.1507E+00	EL	38623	44580.000
0090001	1964	8	16	15	28	0.0000	-6.1184E+03	RNG	3.0765E-01	AZ	-8.0133E-01	EL	38623	55680.000
0090001	1964	8	16	15	29	0.0000	-6.8573E+03	RNG	3.8295E-01	AZ	-8.4310E-01	EL	38623	55740.000
0090001	1964	8	16	15	30	0.0000	-2.7751E+03	RNG	4.4860E-01	AZ	-8.4095E-01	EL	38623	55800.000
0090001	1964	8	16	15	31	0.0000	5.2159E+03	RNG	4.8157E-01	AZ	-7.9429E-01	EL	38623	55860.000
0090002	1964	8	15	16	57	0.0000	1.5211E+03	RNG	1.1618E-01	AZ	-1.0148E+00	EL	38623	61020.000
0090002	1964	8	16	16	58	0.0000	-8.4432E+03	RNG	1.4354E-01	AZ	-1.1552E+00	EL	38623	61080.000
0090002	1964	8	16	16	59	0.0000	-1.3558E+04	RNG	2.1954E-01	AZ	-1.2119E+00	EL	38623	61140.000
0090002	1964	8	15	17	0	0.0000	-1.0744E+04	RNG	3.0655E-01	AZ	-1.1336E+00	EL	38623	61200.000
0090002	1964	8	16	17	1	0.0000	-2.2753E+03	RNG	3.5173E-01	AZ	-9.7480E-01	EL	38623	61260.000
0090002	1964	8	15	17	2	0.0000	7.9316E+03	RNG	3.6114E-01	AZ	-8.1401E-01	EL	38623	61320.000
0090003	1964	8	16	18	25	0.0000	2.0690E+04	RNG	1.9155E-01	AZ	-1.0434E+00	EL	38623	66300.000
0090003	1964	8	15	18	26	0.0000	6.6799E+03	RNG	1.6136E-01	AZ	-1.3589E+00	EL	38623	66360.000
0090003	1964	8	15	18	27	0.0000	-1.1036E+04	RNG	9.5496E-02	AZ	-1.8453E+00	EL	38623	66420.000
0090003	1964	8	15	18	28	0.0000	-2.8892E+04	RNG	2.1144E-02	AZ	-2.2312E+00	EL	38623	66480.000
0090003	1964	8	15	18	29	0.0000	-2.6325E+04	RNG	1.2254E-01	AZ	-1.9183E+00	EL	38623	66540.000
0090003	1964	8	15	18	30	0.0000	-1.1609E+04	RNG	2.1121E-01	AZ	-1.3912E+00	EL	38623	66600.000
0090003	1964	8	15	18	31	0.0000	1.8438E+03	RNG	2.4202E-01	AZ	-1.0271E+00	EL	38623	66660.000
0090003	1964	8	15	18	32	0.0000	1.3292E+04	RNG	2.5305E-01	AZ	-7.9993E-01	EL	38623	66720.000
0060001	1964	8	16	18	33	0.0000	-7.6649E+04	RNG	-7.9060E-02	AZ	-5.3474E-01	EL	38623	66780.000
0060001	1964	8	15	18	34	0.0000	-8.8371E+04	RNG	-9.8217E-02	AZ	-5.9098E-01	EL	38623	66840.000
0050001	1964	8	16	18	35	0.0000	-1.0111E+05	RNG	1.1402E-02	AZ	-5.5867E-01	EL	38623	66900.000
0060001	1964	8	15	18	36	0.0000	-1.0593E+05	RNG	1.1116E+00	AZ	-4.8610E-04	EL	38623	66960.000
0060001	1964	8	16	18	37	0.0000	-4.1937E+04	RNG	3.7652E+00	AZ	-1.5507E+00	EL	38623	67020.000
0060001	1964	8	15	18	38	0.0000	3.2485E+04	RNG	2.1183E+00	AZ	-1.8626E+00	EL	38623	67080.000
0060001	1964	8	15	18	39	0.0000	6.4311E+04	RNG	1.2775E+00	AZ	-1.2035E+00	EL	38623	67140.000
0060001	1964	8	16	18	40	0.0000	8.1036E+04	RNG	9.1514E-01	AZ	-8.3730E-01	EL	38623	67200.000
0060001	1964	8	15	18	41	0.0000	9.2000E+04	RNG	7.2426E-01	AZ	-6.2982E-01	EL	38623	67260.000
0090004	1964	8	15	19	54	0.0000	9.9279E+03	RNG	4.3546E-01	AZ	-1.2301E+00	EL	38623	71640.000
0090004	1964	8	16	19	55	0.0000	-8.4590E+03	RNG	5.2603E-01	AZ	-1.7714E+00	EL	38623	71700.000
0090004	1964	8	15	19	56	0.0000	-4.2404E+04	RNG	7.3920E-01	AZ	-2.8249E+00	EL	38623	71760.000
0090004	1964	8	15	19	57	0.0000	-8.3158E+04	RNG	-6.8495E-01	AZ	-1.1511E+00	EL	38623	71820.000
0090004	1964	8	15	19	58	0.0000	-3.2978E+04	RNG	-1.8402E-01	AZ	-2.2512E+00	EL	38623	71880.000
0090004	1964	8	15	19	59	0.0000	-7.7099E+03	RNG	3.8521E-03	AZ	-1.4418E+00	EL	38623	71940.000
0090004	1964	8	16	20	0	0.0000	7.9660E+03	RNG	8.2113E-02	AZ	-1.0324E+00	EL	38623	72000.000
0090004	1964	8	15	20	1	0.0000	2.0179E+04	RNG	1.2390E-01	AZ	-8.0225E-01	EL	38623	72060.000
0060002	1964	8	15	20	2	0.0000	-4.1328E+04	RNG	-5.1514E-01	AZ	-6.0920E-01	EL	38623	72120.000
0060002	1964	8	15	20	3	0.0000	-2.7966E+04	RNG	-7.4698E-01	AZ	-7.0650E-01	EL	38623	72180.000
0060002	1964	8	15	20	4	0.0000	-4.9266E+03	RNG	-9.2915E-01	AZ	-8.1586E-01	EL	38623	72240.000
0060002	1964	8	15	20	5	0.0000	2.5070E+04	RNG	-9.3451E-01	AZ	-8.9165E-01	EL	38623	72300.000
0060002	1964	8	15	20	6	0.0000	5.4716E+04	RNG	-7.5563E-01	AZ	-8.8289E-01	EL	38623	72360.000
0060002	1964	8	15	20	7	0.0000	7.8674E+04	RNG	-5.1917E-01	AZ	-8.0346E-01	EL	38623	72420.000

```
0090005   1964   8 15 21 22   1.0000 -6.6495E+03   RNG    5.5421E-01   AZ   -1.0323E+00   EL   38623 76920.000
0090005   1964   8 16 21 23   1.0000 -2.4423E+04   RNG    6.1460E-01   AZ   -1.3509E+00   EL   38623 76980.000
0090005   1964   8 16 21 24   1.0000 -4.7316E+04   RNG    5.6663E-01   AZ   -1.7782E+00   EL   38623 77040.000
0090005   1964   8 15 21 25   1.0000 -6.0912E+04   RNG   -9.2395E-02   AZ   -2.0151E+00   EL   38623 77100.000
0090005   1964   8 16 21 26   1.0000 -3.5964E+04   RNG   -4.7476E-01   AZ   -1.9004E+00   EL   38623 77160.000
0090005   1964   8 15 21 27   1.0000 -8.7365E+03   RNG   -2.9727E-01   AZ   -1.4333E+00   EL   38623 77220.000
0090005   1964   8 16 21 28   1.0000  1.0382E+04   RNG   -1.4865E-01   AZ   -1.0838E+00   EL   38623 77280.000
0010001   1964   8 16 21 33   1.0000 -1.1744E+05   RNG    2.6720E-02   AZ   -3.7427E-01   EL   38623 77580.000
0010001   1964   8 15 21 34   1.0000 -1.2718E+05   RNG    1.5447E-01   AZ   -3.6870E-01   EL   38623 77640.000
0010001   1964   8 16 21 35   1.0000 -1.3317E+05   RNG    5.9531E-01   AZ   -2.7821E-01   EL   38623 77700.000
0010001   1964   8 16 21 36   1.0000 -1.1933E+05   RNG    1.9884E+00   AZ   -1.2593E-01   EL   38623 77760.000
0010001   1964   8 15 21 37   1.0000 -5.0370E+04   RNG    3.6456E+00   AZ   -9.2945E-01   EL   38623 77820.000
0010001   1964   8 15 21 38   1.0000  2.9855E+04   RNG    2.6054E+00   AZ   -1.4173E+00   EL   38623 77880.000
0010001   1964   8 16 21 39   1.0000  7.4482E+04   RNG    1.8260E+00   AZ   -1.1119E+00   EL   38623 77940.000
0010001   1964   8 15 21 40   1.0000  9.8614E+04   RNG    1.2881E+00   AZ   -8.2896E-01   EL   38623 78000.000

TOTAL EDIT SUMMARY

STA     N TYP   RMS     RMS/SIG    MEAN       N TYP   RMS     RMS/SIG    MEAN       N TYP   RMS     RMS/SIG    MEAN
001     8 RNG 1.0E+05 1.0E+03 -4.3E+04       8 AZ  2.0E+00 2.0E+01  1.5E+00       8 EL  8.0E-01 8.0E+00 -6.8E-01
004     5 RNG 5.5E+04 5.5E+02  5.3E+04       5 AZ  7.2E-01 7.2E+00  5.4E-01       5 EL  1.3E+00 1.3E+01 -1.3E+00
005     6 RNG 1.7E+04 1.7E+02 -3.0E+03       6 AZ  4.5E+00 4.5E+01  1.1E+00       6 EL  1.8E+00 1.8E+01 -1.3E+00
006    15 RNG 6.8E+04 6.8E+02 -4.0E+03      15 AZ  1.3E+00 1.3E+01  3.6E-01      15 EL  9.4E-01 9.4E+00 -8.3E-01
009    33 RNG 2.6E+04 2.6E+02 -1.2E+04      33 AZ  3.6E-01 3.6E+00  1.9E-01      33 EL  1.4E+00 1.4E+01 -1.3E+00

ENTER SEGMENT 30 AT    106.3 SECONDS.  EXECUTION TIME FOR SEGMENT 20 WAS      1.7 CP SECS.,     10.0 PP SECS.

ITERATION NUMBER      2
  201 OBSERVATIONS WERE USED IN THIS SOLUTION
CURRENT SOLUTION IS BEST SO FAR
CURRENT SOLUTION IS

NAME                CURRENT VALUE          CORRECTION        BOUND             NEW VALUE              SIGMA
0001     ALPHA      3.51829203723992E+02 -2.26699461E-01   1.50000000E+00   3.51602509263401E+02   1.20826357E-04
0001     DELTA      1.13160493953416E-01 -1.05599386E-01   1.50000000E+00   7.56111375938326E-03   2.02968458E-04
0001     BETA       8.97781643996747E+01  2.15475537E-01   1.50000000E+00   8.99936404363975E+01   8.98199728E-05
0001     AZ         3.54566401661983E+02 -9.16232540E-02   1.50000000E+00   3.54474777407950E+02   7.36258673E-05
0001     R          2.13476963170890E+07  5.46936314E+03   1.50000000E+05   2.13531662862318E+07   5.47662656E+01
0001     V          2.58554824557692E+04 -2.40599258E+00   1.50000000E+01   2.58530764631926E+04   6.77420654E-02
0001     DRAG       1.22434282701928E-03  8.29721686E-03   1.50000000E-02   9.52155968620821E-03   6.02311948E-06

RMS FOR THIS SOLUTION           =     3.0655522484E+02
```

```
PREDICTED RMS FOR NEXT SOLUTION =     9.7959735872E+00

 XT((ATA)X)  = 1.88699091E+07   XT(ATB)  = 1.88699091E+07   RATIO   = 1.00000000E+00

 CORRELATION MATRIX      DETERMINANT  = 8.39750581E-07


    0001          0001          0001          0001          0001          0001          0001
   ALPHA         DELTA         BETA           AZ            R             V            DRAG
 1.000000000
  .126707585   1.000000000
 -.095784306   -.524526749   1.000000000
  .469347141    .172114292   -.281620817   1.000000000
  .105068389    .837164667   -.604628379    .113595954   1.000000000
 -.103952302   -.831937276    .621176562   -.115757975   -.999467638   1.000000000
  .009335237   -.329568072    .538698927   -.090391574   -.511015911    .536827303   1.000000000

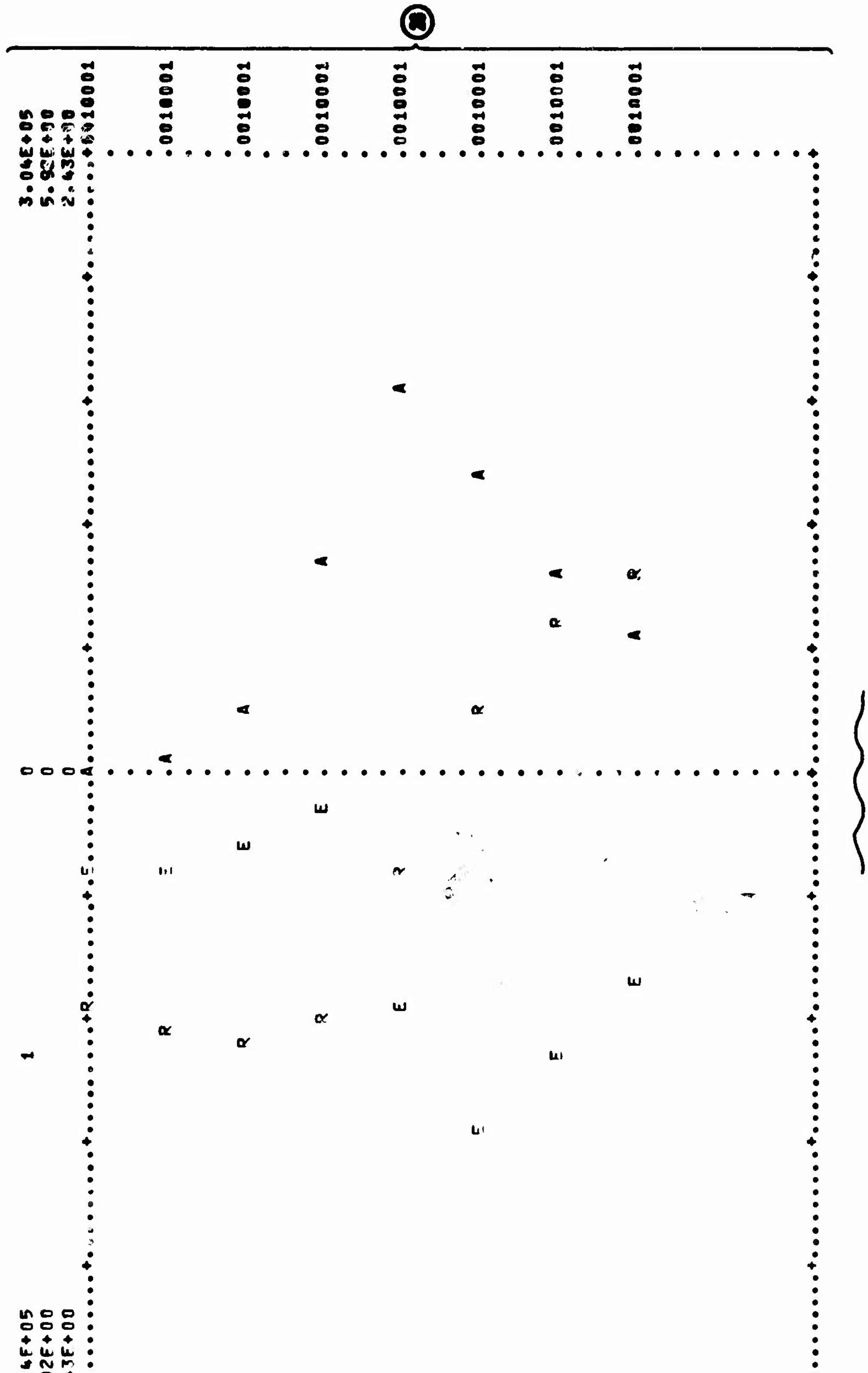

ENTER SEGMENT 40 AT    106.4 SECONDS.  EXECUTION TIME FOR SEGMENT 30 WAS      .2 CP SECS.,      2.7 PP SECS.
**** ORBITAL ELEMENTS FOR VEHICLE    1 FOR ITERATION   3. ****

 YEAR/MO/DY          X              ALPHA            A                AF            MEAN ANOMOLY    APOGEE RADIUS
     HR/MIN          Y              DELTA            E                AG            ECCENTRC ANOM   APOGEE HEIGHT
    SECONDS          Z               BETA            I                 N            TRUE ANOMOLY    PERIGEE RADIUS
   LATITUDE        XDOT            AZIMUTH           O                 L            KEPLERIAN PER   PERIGEE HEIGHT
  LONGITUDE        YDOT             RADIUS           U               CHI             ANOMALY PER            O-DOT
     HEIGHT        ZDOT           VELOCITY          TAU               ST            NODAL PERIOD            U-DOT

 1964/ 8/16   21124233.035   351.602508852   21653940.572  .0137249932016      .45143749       3613.28299
     12/ 7    -3118410.042      .007561114    .01389049192 -.0021378323792     .45779644        169.35013
 0.0000000        2817.893    89.993640436   95.525222544  .0674629243904      .46420017       3514.27767
   .0076121    -364.0479416   354.474776997  351.603240608  351.598074400      88.9377396         70.34480
204.9368856   -2462.4712545   21353156.286   359.543396168  -.16083438689      89.0784160       .8515526064
   70.3456    25732.9607125   25853.0764632    726.8884727  1.08959477675      89.0140698    -4.2171138077

END OF LEAST SQUARES PROCESS - MAXIMUM ITERATIONS ( 2) REACHED.(10)
```

ITEM	DESCRIPTION	REFERENCE SECTION
19	Indication of the reason for ending the least-squares process. In this case, it was because the maximum number of iterations had been reached. Other reasons for ending the process could be convergence or the lack of additional computer running time	2.2.2

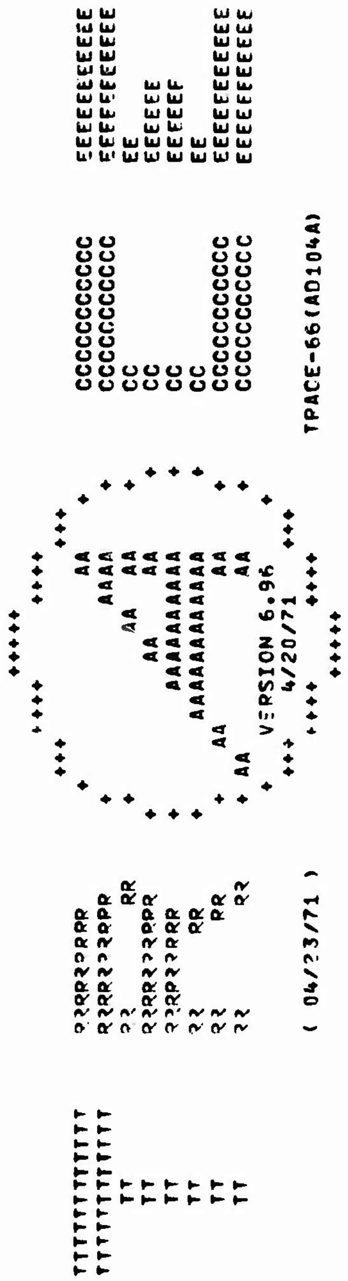

R -3.04E+05
A -5.92E+00
E -2.43E+00
3.04E+05
5.92E+00
2.43E+00
0
1

ITEM	DESCRIPTION	REFERENCE SECTION
20	An example of the printer plot of the measurement residuals for the last iteration if GPLOT is input $\neq 0$ Its order is by station input, then by measurement encounter	2.2.1 11.1.2 15
	Each page contains a maximum of six different measurements for a station. The first six, or fewer, lines contain the measurement type identifiers and the ranges of the residuals (the maximum negative value, a zero, and the maximum positive value) for the measurement types encountered first. The first line also has the VEHID printed between the maximum negative value and the zero. The identifiers and corresponding measurements are shown as follows (note that since only one character can be used as an identifier, some are repeated):	

R	Range	3	Three-way cumulative doppler
A	Azimuth	*	Range rate
E	Elevation	*	Doppler
1	Topocentric right ascension	*	Two-way doppler
2	Topocentric declination	S	SGLS range rate
3	Topocentric hour angle	+	X-antenna
4	Geocentric right ascension	-	Y-antenna
5	Geocentric declination	J	JPL two- or three-way doppler
U	u	T	Tranet doppler
V	v	G	Geoceiver range difference
H	Height	V	Vehicle-vehicle range
X	x	+	Vehicle-vehicle range rate
Y	y	2	Station-vehicle-vehicle range
Z	z	-	Station-vehicle-vehicle range rate
R	Range		
P	P	3	Station-vehicle-vehicle-vehicle range
Q	Q		
D	Range rate	)	Station-vehicle-vehicle-vehicle range rate
7	P rate		
8	Q rate	(	Vehicle-vehicle-vehicle range
9	Accelerometer	D	Time difference of arrival
1	One-way cumulative doppler	O	Time of arrival

The left-hand column contains the system time in sec, incremented by GPLOT(2); the measurement identifiers are used to show the placement of the residual. In the far right-hand margin, the station-pass identification is shown.

C.4 TEST CASE C: ECI SIMULTANEOUS-VEHICLE COVARIANCE ANALYSIS RUN (ITIN = 5)



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MODEL DATA
H1     DATA RELAY SATELLITE                                                            CARD   1
 MULTV1                                                                                CARD   2
DOPBOX20110109            DPRCOVCXX    RXX                                             CARD   3
DTTIN 5                                                                                CARD   4
MOPRAM04,60                                                                            CARD   5
D      GM        0             0                         1.096677E-8                   CARD   6
MGPRAM06,60                                                                            CARD   7
D01,0102,00      0           03,010                   05,012.236E-8                    CARD   8
H      MVS 5,6 MODEL---NO NORMALIZATION                                                CARD   9
 GM    .553339362E-2          OMEGE.43752695E-2       OMEGA.43752695E-2                CARD  10
 ERFT 20925741.               DF     20925741.                                         CARD  11
INFORM1                                                                                CARD  12
INTERM24                                                                               CARD  13
MTERMS04,60                                                                            CARD  14
D      02,00                   -.10826375-2              0                             CARD  15
D      03,00                   +2.566379E-5              0                             CARD  16
D      04,00                   +1.62E-6                  0                             CARD  17
D      05,00                   +1.32665E-7               0                             CARD  18
D      06,00                   -6.49E-7                  0                             CARD  19
D      02,02                   +1.56852217E-06           -8.97210795E-07               CARD  20
D      03,01                   +2.09543973E-06           +1.62018557E-07               CARD  21
D      03,02                   +2.45926844E-07           -2.66420655E-07               CARD  22
D      03,03                   +7.66938326E-08            0.0                          CARD  23
D      04,01                   -5.78695599E-07           -4.64855128E-07               CARD  24
D      04,02                   +7.37902535E-08           +1.58760806E-07               CARD  25
D      04,03                   +5.31876720E-08           +4.18329853E-09               CARD  26
D      04,04                   -6.53285555E-09           +2.37178570E-09               CARD  27
D      05,01                   -4.28174235E-08           +2.56904982E-08               CARD  28
D      05,02                   +1.21376037E-07           -2.75119005E-08               CARD  29
D      05,03                   -2.01509731E-08           +4.95514785E-09               CARD  30
D      05,04                   0                         0                             CARD  31
D      05,05                   0                         0                             CARD  32
D      06,01                   -1.41448651E-07           +9.42988666E-08               CARD  33
D      06,02                   +3.73837758E-09           -4.73526613E-08               CARD  34
D      06,03                   +2.48806140E-09           +7.25686409E-09               CARD  35
D      06,04                   +4.92117583E-10           -1.89273502E-09               CARD  36
D      06,05                   -8.87768432E-11           -2.98614379E-10               CARD  37
D      06,06                   0                         0                             CARD  38
IKSIG 1                  I2    2                 I3      3                             CARD  39
I4     19                I5    58                I6      61                            CARD  40
 SIGMA10.                 2    .01146             3      .01146                        CARD  41
 4     .2                 5    10.                6      10.                           CARD  42
DRANDR X   X                                                                           CARD  43
END                                                                                    CARD  44
```

ITEM	DESCRIPTION	REFERENCE SECTION
1	Card images of the input MODEL data. The inputs used during a covariance analysis run are emphasized here. The input item MULTV indicates that simultaneous vehicles are used:	
	MULTV	2.1.6
	ØPBOX, PRCØV, PANDR	2.5.1
	ITIN	2.1
	ØPRAM	2.1.5.3
	GPRAM	2.1.5.2
	KSIG, SIGMA	2.5.3

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******************************************* LUNAR GRAVITY MODEL *******************************************

GM = 6.8023265000E-05 ER**3/MIN**2  = 1.7314003854E+14 FT**3/SEC**2  = 4.9027777038E+12 M**3/SEC**2
           ***SPHERICAL MOON***

******************************************* EARTH GRAVITY MODEL *******************************************

GM = 5.5303936200E-03 ER**3/MIN**2  = 1.4076545201E+16 FT**3/SEC**2  = 3.9860319162E+14 M**3/SEC**2
              NO NORMALIZATION WITH  24 TERMS.
          N    M       CNM              SNM             **    N    M       CNM              SNM
          2    0   -1.082637000E-03   0.                **    5    2    1.21376037E-07   -2.75119005E-08
          3    0    2.566379310E-06   0.                **    6    2    3.73837758E-09   -4.73526613E-08
          4    0    1.620000010E-06   0.                **    3    3    7.66938326E-08    0.
          5    0    1.326650000E-07   0.                **    4    3    5.31876720E-08    4.18329853E-09
          6    0   -5.490000010E-07   0.                **    5    3   -2.01509731E-08    4.95514785E-09
          3    1    2.095433373E-06   1.62018557E-07    **    6    3    2.48806140E-09    7.25686409E-09
          4    1   -5.786965939E-07  -4.64855128E-07    **    4    4   -6.53285565E-09    2.37176570E-09
          5    1   -4.281742335E-08   2.56904982E-08    **    5    4    0.                0.
          6    1   -1.414485561E-07   9.47988666E-08    **    6    4    4.92117588E-10   -1.89273502E-09
          2    2    1.558522217E-06  -8.97210795E-07    **    5    5    0.                0.
          3    2    2.459268344E-07  -2.66420655E-07    **    6    5   -8.87768432E-11   -2.98614379E-10
          4    2    7.379025336E-08   1.58760806E-07    **    6    6    0.                0.

******************************************* PHYSICAL CONSTANTS *******************************************

GM(ER**3/MIN**2)      =  5.531393620E-03   OMEGE(RAD/MIN)  =  4.375269500E-03   GMLAT(DEG)   =  7.830000000E+01
GMKM(KM**3/MIN**2)    =  0.                OMEGA(RAD/MIN)  =  4.375269500E-03   GMLNG(DEG)   =  2.910000000E+02
SGM(ER**3/MIN**2)     =  6.802326500E-05   OMEGL(RAD/MIN)  =  0.                AM(ER)       =  2.725062770E-01
ERFT(FT/ER)           =  2.092574100E+07   ERKM(KM/ER)     =  6.378164900E+03   ERNM(NM/ER)  =  3.443933600E+03
FTKM(FT/KM)           =  3.281833300E+03   FTNM(FT/NM)     =  6.076115500E+03   AE(ER)       =  1.000000000E+00
GSUBO(FT/SEC**2)      =  3.217400000E+01   DGREE(DEG)      =  5.729577951E+01   SLT          =  2.820176300E+03
CKEP                  =  1.000000000E-07   F               =  3.352329869E-03   PI           =  3.141592654E+00

******************************************* INPUT/OUTPUT CONVERSION FACTORS *******************************
```

```
DF(I/O-ER) =  2.09257410E+07   VF(I/O-ER/MIN) =  3.48762308E+05   AF(I/O-ER/MIN**2) =  5.81278508E+03

******************************************* INTEGRATION INPUTS *******************************************

 IFORM  =   1              ICENT  =   1            NSTEP  =   2
 NPCMP  =   0              IR     =   8            ER     = 1.00000000E-10
 HMIN   = 1.56250000E-02   HMAX   = 6.40000000E+01 HO     = 1.00000000E+00

******************** ******************** SPECIAL OPTIONS *******************************************

 TAPF2  =   0     TAPE7  =   0     TELEM  =   0     PTAPE  =   0     NPDOT  =   0
 PRHO   =   0     NODPR  =   0     CLASS  =   0     LEMSP  =   0     PTNS   =10000

******************************************* CRASH ALTITUDE *******************************************

 ECI CRASH ALTITUDE(FT) =   3.00000000E+05        MCI CRASH ALTITUDE(FT) =   3.00000000E+03

******************************************* STATION LOCATIONS *******************************************
STATION     SIG  REF   RA-REF  DATUM  TYPE        LATITUDE        LONGITUDE       HEIGHT          P    Q
                                                     X               Y               Z
                                                   RADIUS         LATITUDE        LONGITUDE

   1        -0   -0     -0       0      0     4.30000000E+01  -9.30000000E+01  5.00000000E+02
   2        -0   -0     -0       0      0     4.30000000E+01  -9.30000000E+01  5.00000000E+02
   3        -0   -0     -0       0      0     4.30000000E+01  -9.30000000E+01  5.00000000E+02

******************************************* SENSOR PARAMETERS *******************************************

STAPASS PARAMETER P-Q   INITIAL VALUE          BOUND            SIGMA
  1      LAT       Q   -0.                 3.60000000E+02  1.37000000E-04
  1      LONG      Q   -0.                 3.60000000E+02  1.87000000E-04
  1      ALT       Q   -0.                 1.00000000E+10  5.00000000E+01
  1      RBIA      Q   -0.                 1.00000000E+10  1.00000000E+02
  1      ABIA      Q   -0.                 3.60000000E+02  2.00000000E-01
  1      EBIA      Q   -0.                 3.60000000E+02  2.00000000E-01
  2      LAT       Q   -0.                 3.60000000E+02  1.37000000E-04   (2)
  2      LONG      Q   -0.                 3.60000000E+02  1.87000000E-04
  2      ALT       Q   -0.                 1.00000000E+10  5.00000000E+01
  2      RBIA      Q   -0.                 1.00000000E+10  1.00000000E+02
  3      LAT       Q   -0.                 3.60000000E+02  1.37000000E-04
  3      LONG      Q   -0.                 3.60000000E+02  1.87000000E-04
  3      ALT       Q   -0.                 1.00000000E+10  5.00000000E+01
  3      RBIA      Q   -0.                 1.00000000E+10  1.00000000E+02
```

ITEM	DESCRIPTION	REFERENCE SECTION
2	Sensor parameter information. Each line contains the station and pass identification, parameter name, P- or Q-parameter indicator, initial value, bound, and sigma	5

```
ENTER SEGMENT 01 AT    110.7 SECONDS.  EXECUTION TIME FOR SEGMENT  0 WAS   110.7 CP SECS.,    337.7 PP SECS.

*********************************************** VEHICLE DATA ***********************************************

     IYEAR 1969               IMNTH 8                  IDAY  22                   CARD   1
      TZNE 0                   HR   0                  MIN   0                    CARD   2
      SEC  0                  IICTYP3                  IVEHID1                    CARD   3
      IC   1.3834434E8              8.01520E-2              10.                   CARD   4
           -140.                    180.                    -7.18E2               CARD   5
     MVPRAM04,60                                                                  CARD   6
     0     X                        1.E10                   1.E7                  CARD   7
     0     Y                        1.E10                   1.E7                  CARD   8
     0     Z                        1.E10                   1.E7                  CARD   9
     0     DX                       1.E10                   1.E3                  CARD  10
     0     DY                       1.E10                   1.E3                  CARD  11
     0     DZ                       1.E10                   1.E3                  CARD  12
      PT   0                        1                       0                     CARD  13
           15                       30                                            CARD  14
      DRAG 0                                                                      CARD  15
     END                                                                          CARD  16

    EPOCH                                    INITIAL CONDITIONS
  YR/MO/DAY         X,Y,Z,DX,DY,DZ        A,D,B,A,R,V           A,E,I,O,U,TAU         AF,AG,N,L,CHI,PSI
TZNE,HR,MIN,SEC  -1.14512224488E+08   2.19975207933E+02    1.38344340000E+08    6.14005836449E-02
 1969/ 8/22      -9.60061635294E+07  -4.19511075994E-03    8.01529000000E-02    5.15212910005E-02
 0.              -1.09412622380E+04   8.99978948803E+01    1.00000000000E+01    4.17761658205E-03
 0.               5.88925582835E+03   8.00000008710E+01   -1.40000000000E+02    2.19971722355E+02
 0.              -7.02517995470E+03   1.49433038892E+08    1.80000000000E+02   -5.62366289025E-02
 0.               1.61641425299E+03   9.30855966659E+03   -7.18000000000E+02   -6.70202045299E-02

NO PLANETARY PERTURBATIONS.

 ** NO ATMOSPHERE MODEL **
```

ITEM	DESCRIPTION	REFERENCE SECTION
3	Card images of the input VEHICLE data. The items used by a simultaneous-vehicle or covariance analysis run are emphasized	
	VEHID	11.1.2
	VPRAM	11.1.14
	PTIM	11.5.1

```
********************************************** VEHICLE DATA **********************************************

      IVEHID2                                                                                  CARD    1
      IICTYP3                                                                                  CARD    2
       IC    1.38334198E8           0                       5                                  CARD    3
             75                     180                     -7.71343693E2                      CARD    4
      END                                                                                      CARD    5

      EPOCH                                      INITIAL CONDITIONS
    YR/MO/DAY             X,Y,Z,DX,DY,DZ        A,D,B,A,R,V             A,E,I,O,U,TAU           AF,AG,N,L,CHI,PSI
TZNE,HR,MIN,SEC           4.06703434460E+06     8.83143155734E+01       1.38334198000E+08      -8.27566114034E-15
 1969/ 8/22               1.38245315589E+08     1.15423120500E+00       0.                     -1.06388505267E-13
 0.                       2.78671742142E+06     9.00000000000E+01       5.00000000000E+00       4.17807601469E-03
 0.                      -1.00473057857E+04     8.51347337324E+01       7.50000000000E+01       8.83639549683E+01
 0.                       2.78333870503E+02     1.38334198000E+08       1.80000000000E+02       4.21732323555E-02
 0.                       8.55373878177E+02     1.00874919013E+04      -7.71343693000E+02       1.13002835519E-02

NO PLANETARY PERTURBATIONS.

 ** NO ATMOSPHERE MODEL **

********************************************** VEHICLE DATA **********************************************

      IVEHID3                                                                                  CARD    1
      IICTYP3                                                                                  CARD    2
       IC    1.38334198E8           0                       0                                  CARD    3
             75.5                   180                     -7.18E2                            CARD    4
      END                                                                                      CARD    5

********************************************** OBSERVATIONS **********************************************

      EPOCH                                      INITIAL CONDITIONS
    YR/MO/DAY             X,Y,Z,DX,DY,DZ        A,D,B,A,R,V             A,E,I,C,U,TAU           AF,AG,N,L,CHI,PSI
TZNE,HR,MIN,SEC           3.46553508933E+07     7.54915147128E+01       1.38334198000E+08      -2.24851579148E-14
 1969/ 8/22               1.33922796431E+08     0.                      0.                     -8.22551413022E-14
 0.                       0.                    9.00000000000E+01       0.                      4.17807601469E-03
 0.                      -9.76580732694E+03     8.99999996107E+01       7.55000000000E+01       7.54915147128E+01
 0.                       2.52715256980E+03     1.38334198000E+08       1.80000000000E+02       0.
 0.                       0.                    1.00874919013E+04      -7.18000000000E+02      -0.
```

ITEM	DESCRIPTION	REFERENCE SECTION
4	Card images of the input VEHICLE data for the second vehicle and the printout of the initial conditions, perturbation remark, and atmospheric model (repeated for each vehicle used in the simultaneous-vehicle run). Note that inputs not overridden carry over from vehicle to vehicle. In this example, the VPRAM matrix carries over	Case A: Items 17, 18, 19, and 20

NO PLANETARY PERTURBATIONS.

** NO ATMOSPHERE MODEL **

****

THESE ARE THE 34 PARAMETERS IN THE PARAM MATRIX. 18 ARE P PARAMETERS AND 16 ARE Q PARAMETERS

	NAME	P/Q	CURRENT VALUE	BOUND	SIGMA	CONVERSION
0001	X	P	-1.14512224E+08	1.00000000E+10	1.00000000E+07	2.09257410E+07
0001	Y	P	-9.60051535E+07	1.00000000E+10	1.00000000E+07	2.09257410E+07
0001	Z	P	-1.09412622E+04	1.00000000E+10	1.00000000E+07	2.09257410E+07
0001	DX	P	5.38925583E+03	1.00000000E+10	1.00000000E+03	3.48762300E+05
0001	DY	P	-7.02517998E+03	1.00000000E+10	1.00000000E+03	3.48762300E+05
0001	DZ	P	1.51641425E+03	1.00000000E+10	1.00000000E+03	3.48762300E+05
0002	X	P	4.06703434E+06	1.00000000E+10	1.00000000E+07	2.09257410E+07
0002	Y	P	1.38245316E+08	1.00000000E+10	1.00000000E+07	2.09257410E+07
0002	Z	P	2.78671742E+06	1.00000000E+10	1.00000000E+07	2.09257410E+07
0002	DX	P	-1.00473058E+04	1.00000000E+10	1.00000000E+03	3.48762300E+05
0002	DY	P	2.78335871E+02	1.00000000E+10	1.00000000E+03	3.48762300E+05
0002	DZ	P	8.55375878E+02	1.00000000E+10	1.00000000E+03	3.48762300E+05
0003	X	P	3.46559509E+07	1.00000000E+10	1.00000000E+07	2.09257410E+07
0003	Y	P	1.33922796E+08	1.00000000E+10	1.00000000E+07	2.09257410E+07
0003	Z	P	0.	1.00000000E+10	1.00000000E+07	2.09257410E+07
0003	DX	P	-9.76580733E+03	1.00000000E+10	1.00000000E+03	3.48762300E+05
0003	DY	P	2.[illegible]2715257E+03	1.00000000E+10	1.00000000E+03	3.48762300E+05
0003	DZ	P	0.	1.00000000E+10	1.00000000E+03	3.48762300E+05
3	RBIA	Q	-0.	1.00000000E+10	1.00000000E+02	2.09257410E+07
3	ALT	Q	5.30000000E+02	1.00000000E+10	5.00000000E+01	2.09257410E+07
3	LONG	Q	-9.30000000E+01	3.60000000E+02	1.87000000E-04	5.72957795E+01
3	LAT	Q	4.30000000E+01	3.60000000E+02	1.37000000E-04	5.72957795E+01
2	RBIA	Q	-0.	1.00000000E+10	1.00000000E+02	2.09257410E+07
2	ALT	Q	5.30000000E+02	1.00000000E+10	5.00000000E+01	2.09257410E+07
2	LONG	Q	-9.30000000E+01	3.60000000E+02	1.87000000E-04	5.72957795E+01
2	LAT	Q	4.30000000E+01	3.60000000E+02	1.37000000E-04	5.72957795E+01
1	EBIA	Q	-0.	3.60000000E+02	2.00000000E-01	5.72957795E+01
1	ABIA	Q	-0.	3.60000000E+02	2.00000000E-01	5.72957795E+01
1	RBIA	Q	-0.	1.00000000E+10	1.00000000E+02	2.09257410E+07
1	ALT	Q	5.30000000E+02	1.00000000E+10	5.00000000E+01	2.09257410E+07

```
   1     LONG       Q  -9.30000000E+01     3.50000000E+02     1.87000000E-04     5.72957795E+01
   1     LAT        Q   4.30000000E+01     3.60000000F+02     1.37000000E-04     5.72957795E+01
         GM         Q   5.53039362E-03     0.                 1.09667700E-08     1.00000000E+00
         02,00 C    Q  -1.38263700E-03     0.                 2.23600000E-08     1.00000000E+00

ENTER SEGMENT 10 AT    111.6 SECONDS.  EXECUTION TIME FOR SEGMENT  1 WAS     .8 CP SECS.,     4.5 PP SECS.

          TRAJECTORY INTEGRATION FOR CASE   1

IVEP       1      ICENT       1      IDRAG       0      ALPHG    5.761750222E+00  CDAW 0.
JVEP       1      JNORM       1      IR          8      ALG-DEG  3.301239703E+02  ER   1.000000000E-10
MVEP       0      MAJOR       1      ISRP        0      TJDATE   2.440455508E+06  HMIN 1.562500000E-02
KVEP       6      NMASS       0      NEQS       27      TSTART   0.               HMAX 6.400000000E+01
LVEP       0      NT         24      RECMP       0      TSTOP    3.000000000E+01  HO   1.000000000E+00
ICENTX     1      JNORMX      0      NMASSX      0      FLIGHT   3.000000000E+01  NTX  0.
                                     NASA        0      SSTEP    1.000000000E+02  SORD 1.500000000E+00

                                        * PREDETERMINED EVENT TABLE *
 TIME(MME)    TYPE       ASSOCIATED QUANTITIES
    0.0000 TZERO
   30.0000 TSTOP

        ***  TRAJECTORY START

        * * * * * * * * * * * * * * * * * * * *   ECI   * * * * * * * * * * * * * * * * * * * *
SEG11 ENTRY TIME IS  111.70100


                 T  =         0.000000          H  =         .125000          NSTEP  =         0

                 -1.145122244879E+08         5.889255828347E+03          4.830829047242E-01
                 -9.600616352941E+07        -7.025179984701E+03          4.050130141915E-01
                 -1.094126223805E+04         1.616414252985E+03          4.614415693159E-05

 02,00 C          0.                         0.                         -2.444496288923E-06
                  0.                         0.                         -2.049446786235F-06
                  0.                         0.                         -7.000904861358E-10

 GM               0.                         0.                          1.502752099719E-02
                  0.                         0.                          1.259895871988F-02
                  0.                         0.                          1.435431228069E-06

 X                1.000010000000E+00         0.                          1.156849534924E-05
```

```
                0.                        0.                        2.243161066230E-05
                0.                        0.                        2.555248807894E-09

Y               0.                        0.                        2.243161066230E-05
                1.000000000000E+00        0.                        3.619483449938E-06
                0.                        0.                        2.142254137494E-09

Z               0.                        0.                        2.555248807894E-09
                0.                        0.                        2.142254137494E-09
                1.000000000000E+00        0.                       -1.518797879918E-05

DX              0.                        1.000000000000E+00        0.
                0.                        0.                        0.
                0.                        0.                        0.

DY              0.                        0.                        0.
                0.                        1.000000000000E+00        0.
                0.                        0.                        0.

DZ              0.                        0.                        0.
                0.                        0.                        0.
                0.                        1.000000000000E+00        0.

  FORCES       MAGNITUDE     X      Y      Z     ( EXTERNAL UNITS )      RADIAL      IN-TRACK     CROSS-TRACK
GEOPOTENTIAL  6.304004E-01 4.830829E-01 4.050130E-01 4.614416E-05-6.304004E-01-3.420336E-08-6.976752E-09
TOTAL         6.304004E-01 4.830829E-01 4.050130E-01 4.514416E-05-6.304004E-01-3.420336E-08-6.976752E-09


 NODE  T =    1.128141067950E-01   -1.144723499480E+08   -9.605370662137E+07   -1.227973594797E-10
      DT =    1.250000000000E-01    5.892525173075E+03   -7.022437834961E+03    1.616414409103E+03
*             STEP   DOUBLED        T  =    3.250000    H  =    .250000     NSTEP  =     25
*             STEP   DOUBLED        T  =    7.500000    H  =    .500000     NSTEP  =     41
*             STEP   DOUBLED        T  =   15.000000    H  =   1.000000     NSTEP  =     57

                T  =       30.000000        H  =       1.000000      NSTEP  =          71

             -1.031537926203E+08          6.717059485659E+03          4.358762082148E-01
             -1.079671375801E+06         -6.249427521532E+03          4.562150451684E-01
              2.892052284940E+06          1.605453243475E+03         -1.222115672862E-02
```

02,J0 C	-1.067305128407E-03	-7.009771297779E-05	-2.232865286960E-06
	-9.641155372844E-04	-6.572210958654E-05	-2.339382147550E-06
	2.767132854346E-05	2.780059370108E-06	1.864451829015E-07
GM	6.562098262833/3E+00	4.310346463120E-01	1.373717558371E-02
	5.927637541327E+00	4.041346684247E-01	1.439248707537E-02
	-5.693159818645E-02	-5.734773176488E-03	-3.870978531235E-04
X	1.004477955644E+00	2.747868019029E-04	6.820129799268E-06
	1.019931600779E-02	6.827010123838E-04	2.297611316839E-05
	-9.630530433524E-05	-9.522323254205E-06	-6.182057231257E-07
Y	1.019532349771E-02	6.821857296951E-04	2.290744045517E-05
	1.002335995225E+00	1.860943686471E-04	8.890457780075E-06
	-9.024715473606E-05	-9.252425235328E-06	-6.452862051509E-07
Z	-9.588813321212E-05	-9.452713086250E-06	-6.089286477563E-07
	-8.989650187419E-05	-9.194015111649E-06	-6.375017710560E-07
	9.931726272075E-01	-4.546772525530E-04	-1.509178751809E-05
DX	3.004034250283E+01	1.003725452967E+00	1.993488181183E-04
	1.022938151825E-01	1.025315636076E-02	6.853948449331E-04
	-1.432054418944E-03	-1.883767774393E-04	-1.838115336730E-05
DY	1.022743425880E-01	1.025006160901E-02	6.848790387747E-04
	3.002754670061E+01	1.003149681995E+00	2.616909180022E-04
	-1.372021153866E-03	-1.865284733097E-04	-1.922631782016E-05
DZ	-1.429954053661E-03	-1.879587038032E-04	-1.831147254788E-05
	-1.370257148254E-03	-1.861776660532E-04	-1.916784830180E-05
	2.993159056583E+01	9.931714844961E-01	-4.548297409590E-04

```
 FORCES       MAGNITUDE     X       Y      Z     ( EXTERNAL UNITS )      RADIAL        IN-TRACK     CROSS-TRACK
GEOPOTENTIAL  6.310860E-01  4.358762E-01  4.562150E-01-1.222116E-02-6.310860E-01-1.739166E-07-7.744879E-07
TOTAL         6.310860E-01  4.358762E-01  4.562150E-01-1.222116E-02-6.310860E-01-1.739166E-07-7.744879E-07
```

*** TRAJECTORY TERMINATION

```
***  THIS CASE TOOK      1.129  SECONDS TO INTEGRATE A SPAN OF     30.0000  MINUTES  ***

     ***  FROM            0.000  TO          30.000  MINUTES FROM MIDNIGHT OF EPOCH  ***

   TRAJECTORY INTEGRATION FOR CASE   2

IVEP      1      ICENT       1      IDRAG      0      ALPHG    5.761750222E+00  CDAW 0.
JVEP      1      JNORM       1      IR         9      ALG-DES  3.301239703E+02  ER   1.000000000E-10
MVEP      0      MAJOR       1      ISRP       0      TJDATE   2.440455500E+06  HMIN 1.562500000E-02
KVEP      6      NMASS       0      NEQS      27      TSTART   0.               HMAX 6.400000000E+01
LVEP      0      NT         24      RECMP      0      TSTOP    3.000000000E+01  H0   1.000000000E+00
IDENTY    1      JNORMX      0      NMASSX     0      FLIGHT   3.000000000E+01  NTX  0.
                                    NASA              SSTEP    1.000000000E+02  SORD 1.500000000E+00

                                  * PREDETERMINED EVENT TABLE *
 TIME(MME)    TYPE       ASSOCIATED QUANTITIES
    0.0000 TZERO
   30.0000 TSTOP

   ***  TRAJECTORY START

   * * * * * * * * * * * * * * * * * * * *   ECI   * * * * * * * * * * * * * * * * * * * *
SEG1  ENTRY TIME IS  112.85300

                 T  =        0.000000        H  =          .125000        NSTEP  =            0

                  4.067034344601E+06       -1.0047305785571E+04      -2.162744150928E-02
                  1.382463155891E+08        2.783368705028E+02       -7.351517941123E-01
                  2.786717421420E+06        8.553758781768E+02       -1.482002055073E-02

  02,00 C         0.                        0.                        1.274437767438E-07
                  0.                        0.                        4.332058961582E-06
                  0.                        0.                        2.623271566750E-07

  GM              0.                        0.                       -6.727765114806E-04
                  0.                        0.                       -2.286876416886E-02
                  0.                        0.                       -4.610143886837E-04

  X               1.000000000000E+00        0.                       -1.909406277137E-05
                  0.                        0.                        1.687467803763E-06
                  0.                        0.                        3.401905643118E-08
```

```
Y              0.                        0.                        1.687467803763E-06
               1.000000000000E+00        0.                        3.821588824887E-05
               0.                        0.                        1.156376870886E-06

Z              0.                        0.                        3.401905643118E-08
               0.                        0.                        1.156376870886E-06
               1.000000000000E+00        0.                       -1.912181747751E-05

DX             0.                        1.000000000000E+00        0.
               0.                        0.                        0.
               0.                        0.                        0.

DY             0.                        0.                        0.
               0.                        1.000000000000E+00        0.
               0.                        0.                        0.

DZ             0.                        0.                        0.
               0.                        0.                        0.
               0.                        1.000000000000E+00        0.

  FORCES       MAGNITUDE     X       Y      Z     ( EXTERNAL UNITS )       RADIAL        IN-TRACK     CROSS-TRACK
GEOPOTENTIAL  7.356192E-01-2.162744E-02-7.351518E-01-1.482002E-02-7.356192E-01  9.718920E-08-1.118119E-06
TOTAL         7.356192E-01-2.162744E-02-7.351518E-01-1.482002E-02-7.356192E-01  9.718920E-08-1.118119E-06

*              STEP   DOUBLED         T  =     3.250000      H  =      .250000      NSTEP  =       25
*              STEP   DOUBLED         T  =     7.500000      H  =      .500000      NSTEP  =       41
*              STEP   DOUBLED         T  =    15.000000      H  =     1.000000      NSTEP  =       57

                 T  =       30.000000          H  =        1.000000       NSTEP  =        71

              -1.400121703040E+07       -9.999653462887E+03        7.445408033301E-02
               1.375556473079E+08       -1.043534496067E+03       -7.314849971285E-01
               4.298002445426E+06        8.214176207192E+02       -2.285719126977E-02

02,00 C       -2.802572537901E-05       -4.741633923443E-06       -4.483036949437E-07
               1.952925550034E-03        1.303970673860E-04        4.372298978955E-06
               1.395939607512E-04        1.001955722892E-05        4.050207347041E-07

GM             1.482672897244E-01        2.508374932340E-02        2.373017363729E-03
```

```
         -1.031835027654E+01     -6.892533705414E-01     -2.314441681329E-02
         -2.461874755292E-01     -1.772837401649E-02     -7.246686026364E-04

 X        9.914272990064E-01     -5.680081449113E-04     -1.839421018251E-05
         -3.635617942318E-04     -6.145012900747E-05     -5.744386322036E-06
         -1.073532393402E-05     -1.785119061049E-06     -1.795199097829E-07

 Y       -3.693731264649E-04     -6.241723129230E-05     -5.873111043707E-06
          1.017234653492E+00      1.149388370508E-03      3.829710369053E-05
          6.163371735316E-04      4.427394692864E-05      1.793490631172E-06

 Z       -1.086745890223E-05     -1.807[illegible]19928568E-06     -1.824349837512E-07
          6.158462534138E-04      4.[illegible]749907E-05      1.782610832439E-06
          9.914119190898E-01     -5.715525417284E-04     -1.892465283486E-05

 DX       2.991448216747E+01      9.915082636154E-01     -5.550210678596E-04
         -9.267732775470E-03     -1.485972548969E-03     -1.732620244910E-04
         -2.567657963390E-04     -4.299783690502E-05     -5.414942578455E-06

 DY      -9.296852322778E-03     -1.491780883369E-03     -1.742291272889E-04
          3.017196880907E+01      1.017148866298E+00      1.135887758193E-03
          6.627238215817E-03      7.092581074666E-04      5.341831321044E-05

 DZ      -2.574248749686E-04     -4.312937141402E-05     -5.436843357366E-06
          6.624732105526E-03      7.087671875916E-04      5.333657382664E-05
          2.991409287218E+01      9.914167476987E-01     -5.710390014654E-04

  FORCES       MAGNITUDE     X       Y      Z    ( EXTERNAL UNITS )       RADIAL        IN-TRACK      CROSS-TRACK
GEOPOTENTIAL  7.356196E-01 7.445408E-02-7.314850E-01-2.285719E-02-7.356196E-01 5.249624E-08-1.712987E-06
TOTAL         7.356196E-01 7.445408E-02-7.314850E-01-2.285719E-02-7.356196E-01 5.249624E-08-1.712987E-06


     ***  TRAJECTORY TERMINATION

     ***  THIS CASE TOOK      1.132  SECONDS TO INTEGRATE A SPAN OF     30.0000  MINUTES  ***

        ***  FROM           0.000  TO          30.000  MINUTES FROM MIDNIGHT OF EPOCH  ***

      TRAJECTORY INTEGRATION FOR CASE   3
```

```
IVEP        1      ICENT       1      IDRAG       0      ALPHG    5.761750222E+00  CDAW 0.
JVEP        1      JNORM       1      IR          9      ALG-DEG  3.301239703E+02  ER   1.000000000E-10
MVEP        0      MAJOR       1      ISRP        0      TJDATE   2.440455500E+06  HMIN 1.562500000E-02
KVEP        6      NMASS       0      NEQS       27      TSTART   0.               HMAX 6.400000000E+01
LVEP        0      NT         24      RECMP       0      TSTOP    3.000000000E+01  H0   1.000000000E+00
ICENTX      1      JNORMX      0      NMASSX      0      FLIGHT   3.000000000E+01  NTX  0.
                                      NASA        0      SSTEP    1.000000000E+02  SORD 1.500000000E+00

                                        * PREDETERMINED EVENT TABLE *
 TIME(MME)     TYPE       ASSOCIATED QUANTITIES
     0.0000 TZERO
    30.0000 TSTOP

        ***  TRAJECTORY START

        * * * * * * * * * * * * * * * * * * * *   ECI  * * * * * * * * * * * * * * * * * * * *
SEG1* ENTRY TIME IS  114.00500

                   T  =         0.000000         H  =          .125000        NSTEP  =            0

                     3.465535083333E+07         -9.765807326943E+03          -1.842899424245E-01
                     1.339227954313E+08          2.527152569800E+03          -7.121605279939E-01
                     0.                          0.                          -1.006964949376E-08

  02,00 C            0.                          0.                           1.088179954344E-06
                     0.                          0.                           4.205110486071E-06
                     0.                          0.                           0.

  GM                 0.                          0.                          -5.732806837653E-03
                     0.                          0.                          -2.215356242819E-02
                     0.                          0.                          -3.132420288982E-10

  X                  1.000000000000E+00          0.                          -1.553911309570E-05
                     0.                          0.                           1.392937542766E-05
                     0.                          0.                          -4.344817468047E-13

  Y                  0.                          0.                           1.392937542766E-05
                     1.000000000000E+00          0.                           3.468423879095E-05
                     0.                          0.                           1.386397852185E-12

  Z                  0.                          0.                          -4.344817468047E-13
```

```
                    0.                         0.                         1.386397862185E-12
                    1.000000000000E+00         0.                        -1.914512569526E-05

 DX                 0.                         1.000000000000E+00         0.
                    0.                         0.                         0.
                    0.                         0.                         0.

 DY                 0.                         0.                         0.
                    0.                         1.000000000000E+00         0.
                    0.                         0.                         0.

 DZ                 0.                         0.                         0.
                    0.                         0.                         0.
                    0.                         1.000000000000E+00         0.

   FORCES      MAGNITUDE     X       Y       Z     ( EXTERNAL UNITS )        RADIAL        IN-TRACK      CROSS-TRACK
 GEOPOTENTIAL 7.356191E-01-1.842899E-01-7.121605E-01-1.006965E-08-7.356191E-01 1.746302E-07-1.006965E-08
 TOTAL        7.356191E-01-1.842899E-01-7.121605E-01-1.006965E-08-7.356191E-01 1.746302E-07-1.006965E-08

 *             STEP    DOUBLED          T  =      3.250000      H  =      .250000      NSTEP  =        25
 *             STEP    DOUBLED          T  =      7.500000      H  =      .500000      NSTEP  =        41
 *             STEP    DOUBLED          T  =     15.000000      H  =     1.000000      NSTEP  =        57

                 T  =         30.000000        H  =         1.000000        NSTEP  =         71

                    1.682930795167E+07        -1.001256909845E+04        -8.949604214476E-02
                    1.373065756953E+08         1.227201690960E+03        -7.301551530551E-01
                   -1.628942753407E-02        -1.807336948206E-05        -9.983033663556E-09

 D2,00 C            4.070847007474E-04         2.437527762037E-05         5.342934860491E-07
                    1.916539328183E-03         1.286730581928E-04         4.385942515055E-06
                    5.917821148882E-14         7.662493042071E-15         7.272527446215E-16

 GM                -2.144625248825E+00        -1.284151381294E-01        -2.814794016769E-03
                   -1.009679711925E+01        -6.778813727344E-01        -2.310621656102E-02
                   -1.414727134905E-07        -9.464543733016E-09        -3.197602452963E-10

 X                  9.925392193491E-01        -5.102966186224E-04        -1.812069354333E-05
                    5.257032259425E-03         3.161725696603E-04         7.080467209392E-06
```

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```
                 -2.214233915733E-10         -1.557665160814E-11         -5.973181391956E-13

Y                 5.251231741357E-03          3.152017735133E-04          6.951250815456E-06
                  1.016137602155E+00          1.092830260297E-03          3.807937322965E-05
                  6.144258208723E-10          4.061547379242E-11          1.317067303713E-12

Z                -2.215154120324E-10         -1.559210221234E-11         -5.994337175659E-13
                  6.146077081433E-10          4.064573851100E-11          1.321091280946E-12
                  9.913970555523E-01         -5.727059617717E-04         -1.898043935721E-05

DX                2.992313041991E+01          9.921252091104E-01         -5.470746835051E-04
                  4.732637541441E-02          4.205822502993E-03          2.093005529613E-04
                 -2.353651543415E-09         -2.482414436165E-10         -1.823644774703E-11

DY                4.729770487385E-02          4.199991983422E-03          2.083297562321E-04
                  3.016339232585E+01          1.016551615658E+00          1.129608695166E-03
                  6.088616203347E-09          6.031274802870E-10          3.939547750913E-11

DZ               -2.354115772231E-09         -2.483360037071E-10         -1.825260519300E-11
                  6.089525257188E-09          6.033090279937E-10          3.942566661087E-11
                  2.991332110278E+01          9.913970528152E-01         -5.727063261363E-04

 FORCES        MAGNITUDE      X        Y        Z     ( EXTERNAL UNITS )      RADIAL       IN-TRACK     CROSS-TRACK
GEOPOTENTIAL  7.356195E-01-8.949604E-02-7.301552E-01-9.983034E-09-7.356195E-01 1.746305E-07-1.006966E-08
TOTAL         7.356195E-01-8.949604E-02-7.301552E-01-9.983034E-09-7.356195E-01 1.746305E-07-1.006966E-08


      ***  TRAJECTORY TERMINATION


      ***  THIS CASE TOOK      1.137  SECONDS TO INTEGRATE A SPAN OF     30.0000  MINUTES  ***

          ***  FROM          0.000  TO          30.000  MINUTES FROM MIDNIGHT OF EPOCH  ***


ENTER SEGMENT 21 AT    115.1 SECONDS. EXECUTION TIME FOR SEGMENT  10 WAS     3.5 CP SECS.,     17.8 PP SECS.
RUNNING TIME FOR SEG21 WILL INCLUDE THAT FOR SEG22,SEG23, AND SEG24.
  1     1969  8 22   0 15  0.0000
PARTIALS FOR RNG     -7.521539222E-01   -6.574089152E-01   -9.396491570E-02   -1.125646282E+01   -9.839002780E+00
                     -1.411202182E+00    0.                 0.                 0.                 0.
                      0.                 0.                 0.                 0.                 0.
                      0.                 0.                 0.                 0.                 0.
                      0.                 0.                 0.                 0.                 0.
                      0.                 0.                 0.                 1.000000000E+00   -6.211610330E-01
                      2.461772464E-01    7.055398750E-01   -2.196830241E+00    3.571280823E-04
```

5

ITEM	DESCRIPTION	REFERENCE SECTION
5	Partial derivatives of the measurement (in this case, range) with respect to all parameters at the observation time shown on the first line. The partials are printed across the page in the order shown in the parameter list. The units are internal units	Case B: Items 4 and 6

```
PARTIALS FOR AZ       -1.273004078E-01    1.367271389E-01    6.170396870E-02   -1.911401324E+00    2.053488895E+00
                       9.256146215E-01    0.                 0.                 0.                 0.
                       0.                 0.                 0.                 0.                 0.
                       0.                 0.                 0.                 0.                 0.
                       0.                 0.                 0.                 0.                 0.
                       0.                 0.                 1.000000000E+00    0.                 0.
                       1.336087338E+00   -7.641923509E-01   -1.422546047E-02    2.454676206E-06
PARTIALS FOR EL        2.153833637E-02   -4.558491113E-02    1.456813612E-01    3.239806600E-01   -6.855916569E-01
                       2.197711353E+00    0.                 0.                 0.                 0.
                       0.                 0.                 0.                 0.                 0.
                       0.                 0.                 0.                 0.                 0.
                       0.                 0.                 0.                 0.                 0.
                       0.                 1.000000000E+00    0.                 0.                -1.210363503E-01
                      -3.437678833E-01   -9.905326916E-01   -3.125024284E-02    5.415401331E-06
 1        1969  8 22   0 15  0.0000
PARTIALS FOR RD        1.970208850E-03   -3.045492045E-03    7.317243200E-04   -7.174194756E-01   -6.986737655E-01
                      -8.333085099E-02    0.                 0.                 0.                 0.
                       0.                 0.                 0.                 0.                 0.
                       0.                 0.                 0.                 0.                 0.
                       0.                 0.                 0.                 0.                 0.
                       0.                 0.                 0.                 0.                -3.402956952E-04
                       5.439230197E-04   -6.497490595E-04   -2.931598728E-01    4.764305084E-05
 2        1969  8 22   0 15  0.0000
PARTIALS FOR S2       -4.000359060E-01   -9.131539810E-01   -6.015897430E-03   -5.972374313E+00   -1.377284910E+01
                      -1.204851861E-01    4.127522528E-01    1.923351610E+00   -6.161133578E-02    6.198561629E+00
                       2.876754710E+01   -9.281750174E-01    0.                 0.                 0.
                       0.                 0.                 0.                 0.                 0.
                       0.                 0.                 1.000000000E+00    6.908732761E-01    3.450543492E-01
                      -5.473487325E-01    0.                 0.                 0.                 0.
                       0.                 0.                -6.927454010E+00    1.257255710E-03
 3        1969  8 22   0 15  0.0000
PARTIALS FOR S3       -4.000359060E-01   -9.131539810E-01   -8.015897430E-03   -5.972374313E+00   -1.377284910E+01
                      -1.204851861E-01   -5.921544118E-01    9.957147359E-01    1.221985379E-01   -8.895918843E+00
                       1.499335783E+01    1.834238643E+00    1.206307960E+00    9.034322187E-01   -2.062590273E-01
                       1.810305479E+01    1.349817808E+01   -3.098335541E+00    1.000000000E+00    7.610603832E-01
                       2.078613361E-01   -5.821478754E-01    0.                 0.                 0.
                       0.                 0.                 0.                 0.                 0.
                       0.                 0.                -7.504468632E+00    1.371840296E-03
```

```
1        1969  8 22   0 30  0.0800
PARTIALS FOR RNG    -7.239983371E-01     -7.043704192E-01     -8.284206452E-02     -2.151174800E+01     -2.095512844E+01
                    -2.438621696E+00      0.                   0.                   0.                   0.
                     0.                   0.                   0.                   0.                   0.
                     0.                   0.                   0.                   0.                   0.
                     0.                   0.                   0.                   0.                   0.
                     0.                   0.                   0.                   1.000088000E+00     -6.261657134E-01
                     2.542955378E-01      6.967349549E-01     -8.801036486E+00      1.429921570E-03
PARTIALS FOR AZ     -1.339567919E-01      1.293945144E-01      6.413813284E-02     -4.032607118E+00      3.903575530E+00
                     1.932937857E+00      0.                   0.                   0.                   0.
                     0.                   0.                   0.                   0.                   0.
                     0.                   0.                   0.                   0.                   0.
                     0.                   0.                   0.                   0.                   0.
                     0.                   0.                   1.000000000E+00      0.                   0.
                     1.337987002E+00     -8.033169574E-01     -1.041122308E-01      1.974999381E-05
PARTIALS FOR EL      2.616631961E-02     -4.455868047E-02      1.446315547E-01      7.918326578E-01     -1.339988130E+00
                     4.358805120E+00      0.                   0.                   0.                   0.
                     0.                   0.                   0.                   0.                   0.
                     0.                   0.                   0.                   0.                   0.
                     0.                   0.                   0.                   0.                   0.
                     0.                   1.000000000E+00      0.                   0.                  -1.205585864E-01
                    -3.572115119E-01     -9.825893909E-01     -9.930010515E-02      1.883168186E-05
1        1969  8 22   0 30  0.0000
PARTIALS FOR RD      1.732949712E-03     -3.215008508E-03      7.509020686E-04     -6.495953331E-01     -7.832947976E-01
                    -6.151972554E-02      0.                   0.                   0.                   0.
                     0.                   0.                   0.                   0.                   0.
                     0.                   0.                   0.                   0.                   0.
                     0.                   0.                   0.                   0.                   0.
                     0.                   0.                   0.                   0.                  -3.269296243E-04
                     5.331415433E-04     -6.572105216E-04     -5.875671028E-01      9.541199671E-05
2        1969  8 22   0 30  0.0000
PARTIALS FOR S2     -3.524175881E-01     -9.456698769E-01     -5.228423657E-03     -1.034918947E+01     -2.825902750E+01
                    -1.533281764E-01      2.891369076E-01      1.969842606E+00     -5.808483389E-02      8.727462689E+00
                     5.842804729E+01     -1.775742642E+00      0.                   0.                   0.
                     0.                   0.                   0.                   0.                   0.
                     0.                   0.                   1.000000000E+00      6.878153668E-01      3.450487537E-01
                    -5.511776058E-01      0.                   0.                   0.                   0.
                     0.                   0.                  -2.773499914E+01      5.035852028E-03
3        1969  8 22   0 30  0.0000
PARTIALS FOR S3     -3.524175881E-01     -9.456698769E-01     -5.228423657E-03     -1.034918947E+01     -2.825902750E+01
                    -1.533281764E-01     -6.438696961E-01      9.646372947E-01      1.428068129E-01     -1.942595224E+01
                     2.858904687E+01      4.297560896E+00      1.139284829E+00      9.977219123E-01     -2.285098509E-01
                     3.423873422E+01      2.949266130E+01     -6.894942466E+00      1.000000000E+00      7.610603879E-01
```

```
                    2.078613613E-01   -5.821478526E-01    0.                  0.                  0.
                    0.                0.                  0.                  0.                  0.
                    0.                0.                 -3.002859224E+01     5.495521975E-03

TOTAL EDIT SUMMARY

STA    N TYP   RMS     RMS/SIG    MEAN      N TYP   RMS     RMS/SIG    MEAN      N TYP   RMS     RMS/SIG    MEAN
  1    2 RNG 1.4E+08 1.4E+07 -1.4E+08       2 AZ  1.5E+02 1.4E+04  1.6E+02       2 EL  3.8E+01 3.3E+03 -3.8E+01   6
       2 RD  1.8E+02 8.8E+02  1.7E+02
  2    2 S2  4.1E+08 4.1E+07 -4.1E+08
  3    2 S3  4.5E+08 4.5E+07 -4.5E+08

ENTER SEGMENT 72 AT    115.9 SECONDS.  EXECUTION TIME FOR SEGMENT 21 WAS      .7 CP SECS.,    12.7 PP SECS
```

ITEM	DESCRIPTION	REFERENCE SECTION
6	Edit summary. The restriction to the first 6 measurement types encountered for the first 30 stations still holds	Case B: Item 7

```
*****************************************************************
*                                                               *
*  SIMULTANEOUS VEHICLE COVARIANCE ANALYSIS INPUT AND OUTPUT OPTIONS  *
*                                                               *
*****************************************************************
```

```
**************************************************
*                                                *
*                 OPROX OPTIONS                  *
**************************************************
*                                                *
* A  SQRT OF DIAGONAL OF FULL ATA INVERSE INPUT  *
* C  PRINT DP/DQ                                 *
* D  NORMAL COVAR. ANALYSIS, OBSERVATIONS INPUT  *
* E  NORMAL UPDATE - OUTPUT IS REAL TIME         *
* F  GENERATE PLOT TAPE                          *
* H  PRINT ENTIRE INTER-SATELLITE COV. MATRIX    *
*                                                *
**************************************************
*                                                *
*                 PRCOV OPTIONS                  *
**************************************************
*                                                *
* A  C(P), CORRELATION AND SQRT OF DIAGONAL      *
* B  PRINT C(X)  AT CURRENT TIME WITH P EFFECTS  *
* C  PRINT C(OP) AT CURRENT TIME FOR P EFFECTS   *
* G  PRINT CORRELATION AND SQRT OF DIAGONAL      *
* H  PRINT C(X)  AT CURRENT TIME WITH P+Q EFFECTS*
* I  PRINT C(OP) AT CURRENT TIME FOR P+Q EFFECTS *
*                                                *
**************************************************
```

7

ITEM	DESCRIPTION	REFERENCE SECTION
7	Indicates input/output options requested by ØPBØX and PRCØV for the simultaneous-vehicle error analysis run	2.5.1

```
ENTER SEGMENT 73 AT    116.3 SECONDS.  EXECUTION TIME FOR SEGMENT 72 WAS      .4 CP SECS.,     10.5 PP SECS.

        COVARIANCE MATRICES AT      0.                MINUTES FROM MIDNIGHT OF EPOCH DATE

            ATA(INVERSE) FOR     P     PARAMETERS

           0001 X       0001 Y       0001 Z       0001 DX      0001 DY      0001 DZ      0002 X       0002 Y
           0002 Z       0002 DX      0002 DY      0002 DZ      0003 X       0003 Y       0003 Z       0003 DX
           0003 DY      0003 DZ
0001 X     1.00000E+14
0001 Y     0.           1.00000E+14
0001 Z     0.           0.           1.00000E+14
0001 DX    0.           0.           0.           1.00000E+06
0001 DY    0.           0.           0.           0.           1.00000E+06
0001 DZ    0.           0.           0.           0.           0.           1.00000E+06
0002 X     0.           0.           0.           0.           0.           0.           1.00000E+14
0002 Y     0.           0.           0.           0.           0.           0.           0.           1.00000E+14

0002 Z     0.           0.           0.           0.           0.           0.           0.           0.
           1.00000E+14
0002 DX    0.           0.           0.           0.           0.           0.           0.           0.
           0.           1.00000E+06
0002 DY    0.           0.           0.           0.           0.           0.           0.           0.
           0.           0.           1.00000E+06
0002 DZ    0.           0.           0.           0.           0.           0.           0.           0.
           0.           0.           0.           1.00000E+06
0003 X     0.           0.           0.           0.           0.           0.           0.           0.
           0.           0.           0.           0.           1.00000E+14
0003 Y     0.           0.           0.           0.           0.           0.           0.           0.
           0.           0.           0.           0.           0.           1.00000E+14
0003 Z     0.           0.           0.           0.           0.           0.           0.           0.
           0.           0.           0.           0.           0.           0.           1.00000E+14
0003 DX    0.           0.           0.           0.           0.           0.           0.           0.
           0.           0.           0.           0.           0.           0.           0.           1.00000E+06
0003 DY    0.           0.           0.           0.           0.           0.           0.           0.
           0.           0.           0.           0.           0.           0.           0.           0.
           1.00000E+06
0003 DZ    0.           0.           0.           0.           0.           0.           0.           0.
           0.           0.           0.           0.           0.           0.           0.           0.
           0.           1.00000E+06
```

ITEM	DESCRIPTION	REFERENCE SECTION
8	Time statement, determined by PTIM, that applies to items 9 through 14. Valid until another time statement is made	
9	$(A^TA)^{-1}$ for P-parameters, identified by parameter name (PRCØV (A) = C). This is the covariance matrix of P-parameters, based on measurement uncertainties (observation weights) only	

```
CORRELATION MATRIX

0001 X     1.000
0001 Y     0.000   1.000
0001 Z     0.000   0.000   1.000
0001 DX    0.000   0.000   0.000   1.000
0001 DY    0.000   0.000   0.000   0.000   1.000
0001 DZ    0.000   0.000   0.000   0.000   0.000   1.000
0002 X     0.000   0.000   0.000   0.000   0.000   0.000   1.000
0002 Y     0.000   0.000   0.000   0.000   0.000   0.000   0.000   1.000
0002 Z     0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   1.000
0002 DX    0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   1.000
0002 DY    0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   1.000
0002 DZ    0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   1.000

0003 X     0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000
           1.000
0003 Y     0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000
           0.000   1.000
0003 Z     0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000
           0.000   0.000   1.000
0003 DX    0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000
           0.000   0.000   0.000   1.000
0003 DY    0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000
           0.000   0.000   0.000   0.000   1.000
0003 DZ    0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000
           0.000   0.000   0.000   0.000   0.000   1.000                                              (10)

SQRT DIAG    1.000000E+07   1.000000E+07   1.000000E+07   1.000000E+03   1.000000E+03   1.000000E+03
             1.000000E+07   1.000000E+07   1.000000E+07   1.000000E+03   1.000000E+03   1.000000E+03   (11)
             1.000000E+07   1.000000E+07   1.000000E+07   1.000000E+03   1.000000E+03   1.000000E+03

PIVOT RATIOS
             1.000000E+00   1.000000E+00   1.000000E+00   1.000000E+00   1.000000E+00   1.000000E+00
             1.000000E+00   1.000000E+00   1.000000E+00   1.000000E+00   1.000000E+00   1.000000E+00   (12)
             1.000000E+00   1.000000E+00   1.000000E+00   1.000000E+00   1.000000E+00   1.000000E+00
```

ITEM	DESCRIPTION	REFERENCE SECTION
10	Correlation matrix for P-parameters, i.e., the matrix of Item 9 normalized to 1s on the diagonal (PRCØV(A) = C)	2.5.1
11	Square roots of the diagonal elements of $(A^TA)^{-1}$ (Item 9) in the order shown in the header of Item 9	2.5.1
12	Pivot ratios encountered in the inversion of A^TA are determined by referencing the original diagonal elements of the A^TA matrix to the diagonal element used in pivoting that particular row and column. These will be printed if Items 9, 10, or 11 are printed	

DPJQ MATRIX

	3 RBIA 1 EBIA	3 ALT 1 ARIA	3 LONG 1 RBIA	3 LAT 1 ALT	2 RPIA 1 LONG	2 ALT 1 LAT	2 LONG GM	2 LAT 02,00
0001 X	0.	0.	0.	0.	0.	0.	0.	0.
	0.	0.	0.	0.	0.	0.	0.	0.
0001 Y	0.	0.	0.	0.	0.	0.	0.	0.
	0.	0.	0.	0.	0.	0.	0.	0.
0001 Z	0.	0.	0.	0.	0.	0.	0.	0.
	0.	0.	0.	0.	0.	0.	0.	0.
0001 DX	0.	0.	0.	0.	0.	0.	0.	0.
	0.	0.	0.	0.	0.	0.	0.	0.
0001 DY	0.	0.	0.	0.	0.	0.	0.	0.
	0.	0.	0.	0.	0.	0.	0.	0.
0001 DZ	0.	0.	0.	0.	0.	0.	0.	0.
	0.	0.	0.	0.	0.	0.	0.	0.
0002 X	0.	0.	0.	0.	0.	0.	0.	0.
	0.	0.	0.	0.	0.	0.	0.	0.
0002 Y	0.	0.	0.	0.	0.	0.	0.	0.
	0.	0.	0.	0.	0.	0.	0.	0.
0002 Z	0.	0.	0.	0.	0.	0.	0.	0.
	0.	0.	0.	0.	0.	0.	0.	0.
0002 DX	0.	0.	0.	0.	0.	0.	0.	0.
	0.	0.	0.	0.	0.	0.	0.	0.
0002 DY	0.	0.	0.	0.	0.	0.	0.	0.
	0.	0.	0.	0.	0.	0.	0.	0.
0002 DZ	0.	0.	0.	0.	0.	0.	0.	0.
	0.	0.	0.	0.	0.	0.	0.	0.
0003 X	0.	0.	0.	0.	0.	0.	0.	0.
	0.	0.	0.	0.	0.	0.	0.	0.
0003 Y	0.	0.	0.	0.	0.	0.	0.	0.
	0.	0.	0.	0.	0.	0.	0.	0.
0003 Z	0.	0.	0.	0.	0.	0.	0.	0.
	0.	0.	0.	0.	0.	0.	0.	0.
0003 DX	0.	0.	0.	0.	0.	0.	0.	0.
	0.	0.	0.	0.	0.	0.	0.	0.
0003 DY	0.	0.	0.	0.	0.	0.	0.	0.
	0.	0.	0.	0.	0.	0.	0.	0.
0003 DZ	0.	0.	0.	0.	0.	0.	0.	0.
	0.	0.	0.	0.	0.	0.	0.	0.

13

ATA(INVERSE) FOR P AND Q PARAMETERS 14

0001 X	0001 Y	0001 Z	0001 DX	0001 DY	0001 DZ	0002 X	0002 Y
0002 Z	0002 DX	0002 DY	0002 DZ	0003 X	0003 Y	0003 Z	0003 DX
0003 DY	0003 DZ						

ITEM	DESCRIPTION	REFERENCE SECTION
13	The $\partial P/\partial Q$ matrix printed when ØPBØX(C) = 1; P and Z represent P- and Q-parameter lists, respectively	2.5.1
14	Indicates that the next covariance matrix printed will include the effects of the Q-parameters. Since PRCØV(G)=B, the $(A^T A)^{-1}$ matrix is not printed, but the correlation matrix (Item 10) is	2.5.1

```
CORRELATION MATRIX

0001 X      1.000
0001 Y      0.000   1.000
0001 Z      0.000   0.000   1.000
0001 DX     0.000   0.000   0.000   1.000
0001 DY     0.000   0.000   0.000   0.000   1.000
0001 DZ     0.000   0.000   0.000   0.000   0.000   1.000
0002 X      0.000   0.000   0.000   0.000   0.000   0.000   1.000
0002 Y      0.000   0.000   0.000   0.000   0.000   0.000   0.000   1.000
0002 Z      0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   1.000
0002 DX     0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   1.000
0002 DY     0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   1.000
0002 DZ     0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   1.000

0003 X      0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000
            1.000
0003 Y      0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000
            0.000   1.000
0003 Z      0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000
            0.000   0.000   1.000
0003 DX     0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000
            0.000   0.000   0.000   1.000
0003 DY     0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000
            0.000   0.000   0.000   0.000   1.000
0003 DZ     0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000
            0.000   0.000   0.000   0.000   0.000   1.000

SQRT DIAG     1.000000E 07   1.000000E+07   1.000000E+07   1.000000E+03   1.000000E+03   1.000000E+03   15
              1.000000E+07   1.000000E+07   1.000000E+07   1.000000E+03   1.000000E+03   1.000000E+03
              1.000000E+07   1.000000E+07   1.000000E+07   1.000000E+03   1.000000E+03   1.000000E+03

       STATE COVARIANCE AND CORRELATION MATRIX PARTITIONS AT      0.              MMOED 16
```

ITEM	DESCRIPTION	REFERENCE SECTION
15	Square roots of the diagonal elements of the $(A^TA)^{-1}$ matrix, with the Q-parameter effects included	
16	Indicates time of the state covariance matrix partitions, as indicated by PRCØV(B) through (F) and PRCØV(H) through (L)	2.5.1

```
CARTESIAN    FOR     P     PARAMETERS    VEHICLES    1   AND    1
  1.0000000E+14  0.             0.             0.             0.             0.
                 1.0000000E+14  0.             0.             0.             0.
  1.0000000E+07                 1.0000000E+14  0.             0.             0.
  0.0000000      1.0000000E+07                 1.0000000E+05  0.             0.
  0.0000000      0.0000000      1.0000000E+07                 1.0000000E+06  0.             17
  0.0000000      0.0000000      0.0000000      1.0000000E+03                 1.0000000E+06
  0.0000000      0.0000000      0.0000000      0.0000000      1.0000000E+03
  0.0000000      0.0000000      0.0000000      0.0000000      0.0000000      1.0000000E+03

ORBIT PLNE   FOR     P     PARAMETERS    VEHICLES    1   AND    1
  1.0000000E+14  5.4719543E-01  1.6784568E-03  0.             0.             0.
                 1.0000000E+14 -6.2500000E-02  0.             0.             0.
  1.0000000E+07                 1.0000000E+14  0.             0.             0.
   .0000000      1.0000000E+07                 1.0000000E+06  4.5966431E-09  1.4961188E-10  18
   .0000000      0.0000000      1.0000000E+07                 1.0000000E+06  0.
  0.0000000      0.0000000      0.0000000      1.0000000E+03                 1.0000000E+06
  0.0000000      0.0000000      0.0000000       .0000000      1.0000000E+03
  0.0000000      0.0000000      0.0000000       .0000000       .0000000      1.0000000E+03

CARTESIAN    FOR   P AND Q PARAMETERS    VEHICLES    1   AND    1
  1.0000000E+14  0.             0.             0.             0.             0.
                 1.0000000E+14  0.             0.             0.             0.
  1.0000000E+07                 1.0000000E+14  0.             0.             0.
  0.0000000      1.0000000E+07                 1.0000000E+06  0.             0.             19
  0.0000000      0.0000000      1.0000000E+07                 1.0000000E+06  0.
  0.0000000      0.0000000      0.0000000      1.0000000E+03                 1.0000000E+06
  0.0000000      0.0000000      0.0000000      0.0000000      1.0000000E+03
  0.0000000      0.0000000      0.0000000      0.0000000      0.0000000      1.0000000E+03

ORBIT PLNE   FOR   P AND Q PARAMETERS    VEHICLES    1   AND    1
  1.0000000E+14  5.4719543E-01  1.6784568E-03  0.             0.             0.
                 1.0000000E+14 -6.2500000E-02  0.             0.             0.
  1.0000000E+07                 1.0000000E+14  0.             0.             0.
   .0000000      1.0000000E+07                 1.0000000E+06  4.5966431E-09  1.4961188E-10  20
   .0000000      0.0000000      1.0000000E+07                 1.0000000E+06  0.
  0.0000000      0.0000000      0.0000000      1.0000000E+03                 1.0000000E+06
  0.0000000      0.0000000      0.0000000       .0000000      1.0000000E+03
  0.0000000      0.0000000      0.0000000       .0000000       .0000000      1.0000000E+03

CARTESIAN    FOR     P     PARAMETERS    VEHICLES    2   AND    2
  1.0000000E+14  0.             0.             0.             0.             0.
                 1.0000000E+14  0.             0.             0.             0.
  1.0000000E+07                 1.0000000E+14  0.             0.             0.
```

ITEM	DESCRIPTION	REFERENCE SECTION
17	Cartesian covariance matrix for Satellite i with respect to itself in an upper triangular format. The lower triangular matrix printed is the normalized correlation matrix. The top item of each column is the square root of the diagonal element (of that column) in the unnormalized matrix. It is identified as a P-parameter matrix, indicating that only the effects of measurement uncertainties are included	2.5.1 [ØPBØX(H), PRCØV(B)]
18	Orbit plane matrices (Item 17)	2.5.1 [ØPBØX(H), PRCØV(C)]
19	Cartesian matrices (Item 17), but including both P- and Q-parameter effects	2.5.1 [ØPBØX(H), PRCØV(H)]
20	Orbit plane matrices (Item 17), but including both P- and Q-parameter effects	2.5.1 [ØPBØX(H), PRCØV(I)]

```
  0.0000000      1.0000000E+07                 1.0000000E+06  0.             0.
  0.0000000      0.0000000      1.0000000E+07                 1.0000000E+06  0.
  0.0000000      0.0000000      0.0000000      1.0000000E+03                 1.0000000E+06
  0.0000000      0.0000000      0.0000000      0.0000000      1.0000000E+03
  0.0000000      0.0000000      0.0000000      0.0000000      0.0000000      1.0000000E+03

ORBIT PLNE   FOR      P      PARAMETERS     VEHICLES    2   AND    2
  1.0000000E+14  1.6601563E-02  0.             0.             0.             0.
                 1.0000000E+14 -3.1250000E-02  0.             0.             0.
  1.0000000E+07                 1.0000000E+14  0.             0.             0.
   .0000000      1.0000000E+07                 1.0000000E+06  2.9103830E-10 -1.1641532E-10
   .0000000      -.0000000      1.0000000E+07                 1.0000000E+06 -4.6566129E-10
  0.0000000      0.0000000      0.0000000      1.0000000E+03                 1.0000000E+06
  0.0000000      0.0000000      0.0000000       .0000000      1.0000000E+03
  0.0000000      0.0000000      0.0000000      0.0000000      0.0000000      1.0000000E+03

CARTESIAN    FOR   P AND Q  PARAMETERS     VEHICLES    2   AND    2
  1.0000000E+14  0.             0.             0.             0.             0.
                 1.0000000E+14  0.             0.             0.             0.
  1.0000000E+07                 1.0000000E+14  0.             0.             0.
  0.0000000      1.0000000E+07                 1.0000000E+06  0.             0.
  0.0000000      0.0000000      1.0000000E+07                 1.0000000E+06  0.
  0.0000000      0.0000000      0.0000000      1.0000000E+03                 1.0000000E+06
  0.0000000      0.0000000      0.0000000      0.0000000      1.0000000E+03
  0.0000000      0.0000000      0.0000000      0.0000000      0.0000000      1.0000000E+03

ORBIT PLNE   FOR   P AND Q  PARAMETERS     VEHICLES    2   AND    2
  1.0000000E+14  1.6601563E-02  0.             0.             0.             0.
                 1.0000000E+14 -3.1250000E-02  0.             0.             0.
  1.0000000E+07                 1.0000000E+14  0.             0.             0.
   .0000000      1.0000000E+07                 1.0000000E+06  2.9103830E-10 -1.1641532E-10
   .0000000      -.0000000      1.0000000E+07                 1.0000000E+06 -4.6566129E-10
  0.0000000      0.0000000      0.0000000      1.0000000E+03                 1.0000000E+06
  0.0000000      0.0000000      0.0000000       .0000000      1.0000000E+03
  0.0000000      0.0000000      0.0000000      0.0000000      0.0000000      1.0000000E+03

CARTESIAN    FOR      P      PARAMETERS     VEHICLES    3   AND    3
  1.0000000E+14  0.             0.             0.             0.             0.
                 1.0000000E+14  0.             0.             0.             0.
```

```
 1.0000000E+07                  1.0000000E+14  0.             0.             0.
 0.0000000      1.0000000E+07                  1.0000000E+06  0.             0.
 0.0000000      0.0000000      1.0000000E+07                  1.0000000E+06  0.
 0.0000000      0.0000000      0.0000000      1.0000000E+03                  1.0000000E+06
 0.0000000      0.0000000      0.0000000      0.0000000      1.0000000E+03
 0.0000000      0.0000000      0.0000000      0.0000000      0.0000000      1.0000000E+03

ORBIT PLNE   FOR     P      PARAMETERS    VEHICLES    3  AND   3
 1.0000000E+14  0.             0.             0.             0.             0.
                1.0000000E+14  0.             0.             0.             0.
 1.0000000E+07                 1.0000000E+14  0.             0.             0.
 0.0000000      1.0000000E+07                 1.0000000E+06  0.             0.
 0.0000000      0.0000000      1.0000000E+07                 1.0000000E+05  0.
 0.0000000      1.0000000      0.0000000      1.0000000E+03                 1.0000000E+06
 0.0000000      0.0000000      0.0000000      0.0000000      1.0000000E+03
 0.0000000      0.0000000      0.0000000      0.0000000      0.0000000      1.0000000E+03

CARTESIAN    FOR  P AND Q  PARAMETERS    VEHICLES    3  AND   3
 1.0000000E+14  0.             0.             0.             0.             0.
                1.0000000E+14  0.             0.             0.             0.
 1.0000000E+07                 1.0000000E+14  0.             0.             0.
 0.0000000      1.0000000E+07                 1.0000000E+06  0.             0.
 0.0000000      0.0000000      1.0000000E+07                 1.0000000E+06  0.
 0.0000000      0.0000000      0.0000000      1.0000000E+03                 1.0000000E+06
 0.0000000      0.0000000      0.0000000      0.0000000      1.0000000E+03
 0.0000000      0.0000000      0.0000000      0.0000000      0.0000000      1.0000000E+03

ORBIT PLNE   FOR  P AND Q  PARAMETERS    VEHICLES    3  AND   3
 1.0000000E+14  0.             0.             0.             0.             0.
                1.0000000E+14  0.             0.             0.             0.
 1.0000000E+07                 1.0000000E+14  0.             0.             0.
 0.0000000      1.0000000E+07                 1.0000000E+06  0.             0.
 0.0000000      0.0000000      1.0000000E+07                 1.0000000E+06  0.
 0.0000000      0.0000000      0.0000000      1.0000000E+03                 1.0000000E+06
 0.0000000      0.0000000      0.0000000      0.0000000      1.0000000E+03
 0.0000000      0.0000000      0.0000000      0.0000000      0.0000000      1.0000000E+03
```

CARTESIAN FOR P PARAMETERS VEHICLES 2 AND 1

COVARIANCE

0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.

CORRELATION

0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000

ORBIT PLNE FOR P PARAMETERS VEHICLES 2 AND 1

COVARIANCE

0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.

CORRELATION

0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000

CARTESIAN FOR P AND Q PARAMETERS VEHICLES 2 AND 1

COVARIANCE

0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.

CORRELATION

0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000

ORBIT PLNE FOR P AND Q PARAMETERS VEHICLES 2 AND 1

COVARIANCE

0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.

CORRELATION

0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000

21

ITEM	DESCRIPTION	REFERENCE SECTION
21	<u>The matrices described in Items 17 through 20 for Satellites i and j.</u> Since they are asymmetrical, they are printed entirely and as S_{ij}. The matrices of Items 17 through 20 are variance-covariance matrices of particular satellite state vectors in the indicated coordinate systems; the matrices here are intersatellite covariance matrices	

CARTESIAN FOR P PARAMETERS VEHICLES 3 AND 1

COVARIANCE

0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.

CORRELATION

0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000

0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000

ORBIT PLNE FOR P PARAMETERS VEHICLES 3 AND 1

COVARIANCE

0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.

CORRELATION

0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000

CARTESIAN FOR P AND Q PARAMETERS VEHICLES 3 AND 1

COVARIANCE

0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.

CORRELATION

0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000

```
ORBIT PLNE   FOR   P AND Q  PARAMETERS    VEHICLES    3   AND    1

  COVARIANCE
 0.              0.              0.              0.              0.              0.
 0.              0.              0.              0.              0.              0.
 0.              0.              0.              0.              0.              0.
 0.              0.              0.              0.              0.              0.
 0.              0.              0.              0.              0.              0.
 0.              0.              0.              0.              0.              0.

  CORRELATION
 0.0000000       0.0000000       0.0000000       0.0000000       0.0000000       0.0000000
 0.0000000       0.0000000       0.0000000       0.0000000       0.0000000       0.0000000
 0.0000000       0.0000000       0.0000000       0.0000000       0.0000000       0.0000000
 0.0000000       0.0000000       0.0000000       0.0000000       0.0000000       0.0000000
 0.0000000       0.0000000       0.0000000       0.0000000       0.0000000       0.0000000
 0.0000000       0.0000000       0.0000000       0.0000000       0.0000000       0.0000000

CAPTESIAN    FOR      P      PARAMETERS    VEHICLES    3   AND    2

  COVARIANCE
 0.              0.              0.              0.              0.              0.
 0.              0.              0.              0.              0.              0.
 0.              0.              0.              0.              0.              0.
 0.              0.              0.              0.              0.              0.
 0.              0.              0.              0.              0.              0.
 0.              0.              0.              0.              0.              0.

  CORRELATION
 0.0000000       0.0000000       0.0000000       0.0000000       0.0000000       0.0000000
 0.0000000       0.0000000       0.0000000       0.0000000       0.0000000       0.0000000
 0.0000000       0.0000000       0.0000000       0.0000000       0.0000000       0.0000000
 0.0000000       0.0000000       0.0000000       0.0000000       0.0000000       0.0000000
 0.0000000       0.0000000       0.0000000       0.0000000       0.0000000       0.0000000
 0.0000000       0.0000000       0.0000000       0.0000000       0.0000000       0.0000000

ORBIT PLNE   FOR      P      PARAMETERS    VEHICLES    3   AND    2

  COVARIANCE
```

0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.

CORRELATION

0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000

CARTESIAN FOR P AND Q PARAMETERS VEHICLES 3 AND 2

COVARIANCE

0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.

CORRELATION

0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000

ORBIT PLNE FOR P AND Q PARAMETERS VEHICLES 3 AND 2

COVARIANCE

0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.

```
0.              0.              0.              0.              0.              0.

 CORRELATION
0.0000000       0.0000000       0.0000000       0.0000000       0.0000000       0.0000000
0.0000000       0.0000000       0.0000000       0.0000000       0.0000000       0.0000000
0.0000000       0.0000000       0.0000000       0.0000000       0.0000000       0.0000000
0.0000000       0.0000000       0.0000000       0.0000000       0.0000000       0.0000000
0.0000000       0.0000000       0.0000000       0.0000000       0.0000000       0.0000000
0.0000000       0.0000000       0.0000000       0.0000000       0.0000000       0.0000000

COVARIANCE MATRICES AT     1.500000000E+01    MINUTES FROM MIDNIGHT OF EPOCH DATE

    ATA(INVERSE) FOR     P     PARAMETERS

          0001 X      0001 Y      0001 Z      0001 DX     0001 DY     0001 DZ     0002 X      0002 Y
          0002 Z      0002 DX     0002 DY     0002 DZ     0003 X      0003 Y      0003 Z      0003 DX
          0003 DY     0003 DZ
0001 X    3.53120E+11
0001 Y   -3.95845E+11 4.60113E+11
0001 Z   -5.69830E+10-4.98050E+10 7.98815E+11
0001 DX  -3.91601E+08 4.38308E+08 6.34054E+07 4.34672E+05
0001 DY   4.38931E+08-5.10171E+08 5.54214E+07-4.57127E+05 5.66192E+05
0001 DZ   6.31783E+07 5.52199E+07-8.85759E+08-7.03628E+04-6.15027E+04 9.83064E+05
0002 X    5.33716E+08-6.29350E+08 1.25965E+08-5.82422E+05 6.87427E+05-1.36915E+05 7.60206E+13
0002 Y   -2.40359E+08 2.96756E+08-5.27310E+07 1.47751E+05-1.88544E+05 2.55990E+04-1.59975E+13 4.30231E+12

0002 Z   -1.30249E+07 1.63585E+07-7.93590E+06 1.18188E+04-1.50363E+04 8.05975E+03 4.45137E+12 2.19633E+12
          9.91881E+13
0002 DX  -1.13203E+04 1.32332E+04-2.35961E+03 1.26326E+01-1.48246E+01 2.63953E+00-2.19683E+08-1.43406E+08
          3.94952E+07 9.93174E+05
0002 DY   3.25854E+04-3.67383E+04-2.57392E+03-3.72067E+01 4.20588E+01 2.56069E+00-1.45203E+08-8.58606E+08
          1.99298E+07-1.30267E+03 9.92470E+05
0002 DZ  -2.02065E+03 2.31452E+03 2.47115E+00 2.21733E+00-2.53874E+00-9.66537E-03 3.98806E+07 1.99271E+07
         -7.31579E+06 3.53396E+02 1.82549E+02 9.99932E+05
0003 X    7.95618E+08-9.14109E+08 6.95473E+07-9.34992E+05 1.07601E+06-9.15048E+04 3.12931E+13-6.90444E+12
         -5.98683E+12 2.73551E+08-6.49518E+07-5.41541E+07 5.08940E+13
0003 Y   -7.27552E+08 8.31115E+08 2.34831E+06 7.52724E+05-8.75885E+05-1.33712E+04 2.33184E+13-5.15376E+12
         -4.58690E+12 2.11323E+08-4.39960E+07-4.12697E+07-3.60614E+13 7.19750E+13
0003 Z   -2.12015E+06-7.63588E+06 6.25016E+07 1.13195E+04-2.09989E+03-6.68831E+04-5.36032E+12 1.18309E+12
          1.01227E+12-4.75526E+07 1.01820E+07 9.19850E+06 8.31580E+12 6.27613E+12 9.86246E+13
0003 DX   2.45174E+04-2.82214E+04 1.56221E+03-2.76669E+01 3.18611E+01-1.86213E+00 2.83191E+08-6.25285E+07
         -5.32841E+07 2.47599E+03-4.95056E+02-4.89451E+02-4.35216E+08-3.32488E+08 7.56176E+07 9.95984E+05
```

```
0003 DY   -1.81126E+03 2.10196E+03 7.25944E+01 1.67363E+00-1.93421E+00-1.75161E-01 2.11548E+08-4.67322E+07
          -4.11377E+07 1.83381E+03-4.01785E+02-3.65425E+02-3.25158E+08-2.46756E+08 5.53336E+07-3.00220E+03
           9.97878E+05
0003 DZ   -2.08193E+03 2.34371E+03 1.87233E+02 2.38779E+00-2.69468E+00-1.85846E-01-4.74797E+07 1.04823E+07
           9.10055E+06-4.31756E+02 9.38095E+01 9.10051E+01 7.51766E+07 5.69381E+07-1.27453E+07 6.77993E+02
           4.93611E+02 9.99365E+05
```

CORRELATION MATRIX

```
0001 X       1.000
0001 Y       -.982    1.000
0001 Z       -.107    -.082    1.000
0001 DX     -1.000     .981     .108    1.000
0001 DY       .982   -1.000     .082    -.982    1.000
0001 DZ       .107     .082   -1.000    -.108    -.082    1.000
0002 X        .000    -.000     .000    -.000     .000    -.000    1.000
0002 Y       -.000     .000    -.000     .000    -.000     .000    -.885    1.000
0002 Z       -.000     .000    -.000     .000    -.000     .000     .051     .106    1.000
0002 DX      -.000     .000    -.000     .000    -.000     .000    -.025    -.069     .004    1.000
0002 DY       .000    -.000    -.000    -.000     .000     .000    -.017    -.416     .002    -.001    1.000
0002 DZ      -.000     .000     .000     .000    -.000    -.000     .005     .010    -.001     .000     .000    1.000

0003 X        .000    -.000     .000    -.000     .000    -.000     .503    -.467    -.084     .039    -.009    -.008
             1.000
0003 Y       -.000     .000     .000     .000    -.000    -.000     .315    -.293    -.054     .025    -.005    -.005
             -.596    1.000
0003 Z       -.000    -.000     .000     .000    -.000    -.000    -.062     .057     .010    -.005     .001     .001
              .117     .074    1.000
0003 DX       .000    -.000     .000    -.000     .000    -.000     .033    -.030    -.005     .002    -.000    -.000
             -.061    -.039     .008    1.000
0003 DY      -.000     .000     .000     .000    -.000    -.000     .024    -.023    -.004     .002    -.000    -.000
             -.046    -.029     .006    -.003    1.000
0003 DZ      -.000     .000     .000     .000    -.000    -.000    -.005     .005     .001    -.000     .000     .000
              .011     .007    -.001     .001     .000    1.000

SQRT DIAG     5.942389E+05   5.783160E+05   8.937646E+05   6.592966E+02   7.524574E+02   9.914957E+02
              8.718980E+06   2.074201E+06   9.959324E+06   9.990364E+02   9.962281E+02   9.999658E+02
              7.134002E+06   8.483807E+06   9.930989E+06   9.979902E+02   9.989384E+02   9.999427E+02

PIVOT RATIOS
              1.000000E+00   5.121352E+00   5.822979E+04   5.573979E+02   9.647004E+09   7.167872E+07
```

```
1.031872E+00    2.757727E+06    1.807008E+10    4.199575E+09    3.748249E+10    1.520903E+08
4.494169E+11    5.827161E+11    4.195380E+10    1.175047E+10    6.545311E+09    3.455491E+08

A PIVOT RATIO EXCEEDS 10**5.
CHECK ATA MATRIX FOR ILL CONDITIONING.  (22)

          DPDQ MATRIX

          3  RBIA      3  ALT       3  LONG      3  LAT       2  RBIA      2  ALT       2  LONG      2  LAT
          1  EBIA      1  ABIA      1  RBIA      1  ALT       1  LONG      1  LAT          GM           02,00
0001 X   -2.36834E-05-7.81713E-06-2.60310E+00 1.26256E+00-7.75560E-06 3.84250E-05 7.80648E-01 4.05204E+00
         -2.80096E+05 1.12494E+06 7.51958E-01-3.70436E-01 1.66467E+06-3.85520E+05 3.40657E+07-5.53076E+03
0001 Y   -4.10495E-05-1.71352E-05-4.49197E+00 7.54816E+00-5.93667E-05-4.68304E-05-6.66842E+00 1.18154E+01
          7.38315E+05-1.33785E+06 6.57451E-01-5.49701E-01-1.98414E+06 4.63045E+05 2.99101E+07-4.85482E+03
0001 Z    7.21551E-06 4.44211E-06 1.09315E-01-2.69904E+00 7.25517E-06 2.64153E-06 3.68664E-02-7.18194E-01
         -2.21382E+06-5.85306E+05 9.49669E-02 5.75163E-01-1.35239E+04 2.66546E+06 8.82286E+06-1.48121E+03
0001 DX   1.04622E-07 5.76326E-08 5.99734E-03-1.23686E-02 8.69107E-08 4.44900E-08 1.00548E-02-1.59178E-02
         -5.84716E+01 8.43196E+01-5.42129E-06 1.84740E-05 1.34747E+02-1.09208E+01-7.66387E+04 1.24547E+01
0001 DY  -1.37459E-08-2.10187E-08-2.45183E-03 2.23575E-03 6.48182E-09 1.15911E-09-3.30283E-03 5.41580E-03
         -4.22238E+01 5.27573E+01-5.01474E-06 1.33685E-05 8.67424E+01-2.40302E+00-6.69553E+04 1.08783E+01
0001 DZ  -1.59490E-09-4.67495E-09-1.29763E-04 1.26740E-03-1.64569E-09 2.88080E-09 3.74166E-04-3.84703E-04
         -2.70105E+01 4.09516E+00-7.35124E-07 8.87116E-06 1.50068E+01 2.30606E+01-9.62948E+03 1.56446E+00
0002 X    2.33352E-01 1.83193E-01 1.83504E+04-5.10754E+04-2.09430E-01-1.44624E-01-2.61938E+04 4.14898E+04
         -2.19788E+04 3.09389E+04-3.78264E-02 3.07754E-02 4.55747E+04-1.16827E+04-5.14906E+06 1.11816E+03
0002 Y   -5.35631E-02-4.11798E-02-4.16692E+03 1.12764E+04-4.68654E-01-3.23975E-01-5.91370E+04 9.37507E+04
          2.59103E+05-3.73458E+05 4.72482E-01-3.79354E-01-5.45564E+05 1.50665E+05 5.45878E+07-1.03153E+04
0002 Z   -4.75240E-02-3.68741E-02-3.65852E+03 1.03891E+04 3.68497E-02 2.55568E-02 4.60286E+03-7.32752E+03
          5.79101E+03-8.25393E+03 1.02692E-02-8.29786E-03-1.21035E+04 3.22602E+03 1.72902E+06-3.30763E+02
0002 DX   2.20449E-06 1.69336E-06 1.67152E-01-4.61607E-01-1.88484E-06-1.32622E-06-2.37883E-01 3.75423E-01
         -1.55103E-01 2.16187E-01-2.62990E-07 2.14921E-07 3.18425E-01-7.93249E-02-4.69598E+01 1.10034E-02
0002 DY  -4.31831E-07-3.20196E-07-3.77475E-02 8.52043E-02-4.09296E-06-2.93216E-06-5.42572E-01 8.26088E-01
          2.28683E+00-3.25725E+00 4.26399E-06-3.40614E-06-4.75493E+00 1.32453E+00 4.96229E+02-8.77074E-02
0002 DZ  -4.33566E-07-3.30549E-07-3.33537E-02 9.18057E-02 3.37760E-07 2.32458E-07 4.28123E-02-6.74839E-02
          5.49158E-02-7.95535E-02 9.71464E-08-7.85397E-08-1.16436E-01 3.14686E-02 1.55675E+01-2.70867E-03
0003 X   -4.10956E-01-3.13569E-01-3.13871E+04 8.70410E+04 1.73981E-01 1.19927E-01 2.20038E+04-3.49852E+04
          1.12986E+05-1.63136E+05 2.05307E-01-1.64980E-01-2.38342E+05 6.57237E+04 2.93490E+07-5.65024E+03
0003 Y   -3.09614E-01-2.31324E-01-2.32935E+04 5.45937E+04 1.33126E-01 9.21630E-02 1.68738E+04-2.66749E+04
          8.51453E+04-1.23118E+05 1.58579E-01-1.26715E-01-1.79513E+05 5.06713E+04 2.12793E+07-4.17091E+03
0003 Z    6.94281E-02 5.39669E-02 5.35700E+03-1.50055E+04-3.04045E-02-2.10249E-02-3.85076E+03 6.09083E+03
         -1.95080E+04 2.80304E+04-3.65622E-02 2.91738E-02 4.09382E+04-1.15718E+04-4.96318E+06 9.50472E+02
0003 DX  -3.88795E-06-2.88580E-06-2.91864E-01 8.11457E-01 1.54838E-06 1.06605E-06 1.94912E-01-3.10914E-01
          9.99090E-01-1.43312E+00 1.87305E-06-1.49468E-06-2.08575E+00 5.86508E-01 2.77277E+02-5.54448E-02
```

ITEM	DESCRIPTION	REFERENCE SECTION
22	A remark printed when the A^TA matrix is inverted if a pivot ratio exceeds 10^5. It hints that the A^TA may be ill-conditioned	

```
0003 DY    -2.87436E-06-2.16387E-06-2.14964E-01 5.16675E-01 1.26298E-06 8.74711E-07 1.59626E-01-2.53642E-01
            7.37147E-01-1.05581E+00 1.38986E-06-1.10765E-06-1.53908E+00 4.35296E-01 1.95535E+02-3.65703E-02
0003 DZ     6.59625E-07 5.08526E-07 5.07943E-02-1.40773E-01-2.62087E-07-1.81147E-07-3.31229E-02 5.25211E-02
           -1.69743E-01 2.41374E-01-3.07621E-07 2.47328E-07 3.53863E-01-9.60879E-02-5.05561E+01 9.41950E-03
```

ATA(INVERSE) FOR P AND Q PARAMETERS

```
0001 X     0001 Y     0001 Z     0001 DX    0001 DY    0001 DZ    0002 X     0002 Y
0002 Z     0002 DX    0002 DY    0002 DZ    0003 X     0003 Y     0003 Z     0003 DX
0003 DY    0003 DZ
```

CORRELATION MATRIX

0001 X	1.000																	
0001 Y	-.978	1.000																
0001 Z	-.091	-.112	1.000															
0001 DX	-.920	.882	.101	1.000														
0001 DY	.920	-.918	.077	-.981	1.000													
0001 DZ	.101	.073	-.887	-.107	-.082	1.000												
0002 X	.000	-.000	.000	-.000	.000	-.000	1.000											
0002 Y	-.015	.018	-.007	-.001	-.001	-.000	-.884	1.000										
0002 Z	-.000	.000	-.000	-.000	-.000	.000	.051	.106	1.000									
0002 DX	.000	-.000	.000	.000	-.000	.000	-.025	-.069	.004	1.000								
0002 DY	-.000	.000	-.000	-.000	.000	-.000	-.017	-.415	.002	-.001	1.000							
0002 DZ	-.000	.000	-.000	.000	-.000	-.000	.005	.010	-.001	.000	.000	1.000						
0003 X	-.002	.002	-.001	-.000	.000	-.000	.503	-.466	-.084	.039	-.009	-.008	1.000					
0003 Y	-.001	.002	-.001	.000	-.000	-.000	.315	-.292	-.054	.025	-.005	-.005	-.596	1.000				
0003 Z	.000	-.000	.000	.000	.000	-.000	-.062	.057	.010	-.005	.001	.001	.117	.074	1.000			
0003 DX	-.000	.000	-.000	-.000	.000	-.000	.033	-.030	-.009	.002	-.000	-.000	-.051	-.039	.008	1.000		
0003 DY	-.000	.000	-.000	-.000	-.000	-.000	.024	-.023	-.004	.002	-.000	-.000	-.046	-.029	.006	-.003	1.000	
0003 DZ	.000	-.000	.000	.000	-.000	.000	-.005	.005	.001	-.000	.000	.000	.011	.007	-.001	.001	.000	1.000

```
SQRT DIAG   6.378695E+05   7.439833E+05   1.004285E+06   6.596158E+02   7.525788E+02   9.915107E+02
```

0.718984E+06	2.076192E+06	9.959324E+06	9.990364E+02	9.962284E+02	9.999658E+02
7.134112E+06	8.483860E+06	9.930992E+06	9.979902E+02	9.989385E+02	9.999427E+02

STATE COVARIANCE AND CORRELATION MATRIX PARTITIONS AT 1.500000000E+01 MMOED

CARTESIAN FOR P PARAMETERS VEHICLES 1 AND 1

3.2175496E+08	-3.6067085E+00	-5.1024804E+07	2.2082945E+04	1.6676030E+04	2.4263728E+03
	4.1914982E+08	-4.5297136E+07	-2.7074724E+04	-1.9063559E+04	-3.4465145E+03
1.7937529E+04		7.2700942E+08	6.2252845E+03	5.4383081E+03	4.6664559E+03
-.9821182	2.0473149E+04		4.3609561E+05	-4.8883923E+05	-7.0230478E+04
-.1070885	-.0820075	2.6979426E+04		5.6810087E+05	-6.1300055E+04
.0019318	-.0020026	.0003494	6.6037536E+02		9.8642773E+05
.0012336	-.0012072	.0002574	-.9021153	7.5372467E+02	
.0001352	-.0001695	.0001741	-.1070705	-.0020047	9.9319068E+02

ORBIT PLNE FOR P PARAMETERS VEHICLES 1 AND 1

8.7777930E+06	3.7919996E+07	7.0223517E+07	-2.3640455E+03	3.2425201E+02	6.0705633E+02
	7.3241417E+00	-3.6698800E+06	-4.4261641E+04	6.1262670E+03	4.3502473E+03
2.9627340E+03		7.2760224E+08	-5.2678386E+02	4.2365401E+01	3.9236209E+03
.4729304	2.7063152E+04		1.1898322E+04	5.1393048E+04	9.5165149E+04
.8787046	-.0050272	2.6974103E+04		9.9268444E+05	-4.9926390E+03
-.0073151	-.0149936	-.0001790	1.0907943E+02		9.8604146E+05
.0001098	.0002272	.0000016	.4720854	9.9633551E+02	
.0002053	.0001619	.0001465	.8785925	-.0050463	9.9299620E+02

CARTESIAN FOR P AND Q PARAMETERS VEHICLES 1 AND 1

6.2200139E+10	-7.1403303E+10	1.6742602E+09	4.5846001E+06	3.3563025E+06	5.5123725E+05
	8.6394210E+10	-3.2655184E+10	-5.6863541E+06	-4.1999294E+06	-8.4880572E+05
2.4939956E+05		2.1393226E+11	3.0695054E+06	2.5054640E+05	1.5101347E+06
-.9741042	2.9391192E+05		4.3647236E+05	-4.0855900E+05	-7.0169303E+04
.0145141	-.2402132	4.6252812E+05		5.6030829E+05	-6.1341510E+04
.0278250	-.0292845	.0100450	6.6066055E+02		9.0644313E+05
.0178514	-.0189554	.0071855	-.9809513	7.5306225E+02	
.0022254	-.0029077	.0033047	-.1069383	-.0019269	9.9319843E+02

ORBIT PLNE FOR P AND Q PARAMETERS VEHICLES 1 AND 1

2.6822083E+09	1.1571932E+10	2.1456425E+10	-7.2146624E+05	9.0954600E+04	1.8545159E+05
	1.5695296E+11	3.4073570E+10	-9.5157091E+06	1.3155750E+06	1.1250127E+06
5.1790041E+04		2.0298145E+11	-2.3165101E+06	3.1210067E+05	1.3087766E+06

.5641743	3.9604666E+05		1.2473137E+04	5.1313587E+04	9.5096076E+04
.0199946	.1954444	4.5053463E+05		9.9269543E+05	-4.9831336E+03
-.1247332	-.2151330	-.0460383	1.1168320E+02		9.8605522E+05
.0019177	.0033340	.0005953	.4611439	9.9634102E+02	
.0035061	.0028606	.0029254	.8574802	-.0050367	9.9300313E+02

CARTESIAN FOR P PARAMETERS VEHICLES 2 AND 2

7.6105349E+13	-1.6288492E+13	4.5017469E+12	3.1628196E+08	-3.0290905E+08	1.3216039E+07
	3.5903182E+12	2.2519239E+12	-6.7715842E+07	6.7798093E+07	1.0688901E+07
8.7238379E+06		9.9558389E+13	1.7985559E+07	7.3707056E+07	4.1820151E+08
-.9853870	1.8948135E+06		9.9762234E+05	-1.3567849E+03	5.4543889E+01
.0517171	.1131100	9.9778350E+06		9.8498301E+05	5.4700879E+01
.0362981	-.0357800	.0018047	9.9881046E+02		9.9797595E+05
-.0349857	.0350526	.0074431	-.0013687	9.9246310E+02	
.0015155	.0055469	.0419553	.0000547	.0000552	9.9898746E+02

ORBIT PLNE FOR P PARAMETERS VEHICLES 2 AND 2

5.0255705E+12	1.9042156E+13	2.9388060E+12	8.3808996E+07	7.6922440E+07	1.2424508E+07
	7.4169309E+13	-2.9536344E+12	3.1663350E+08	2.9974764E+08	-1.1871329E+07
2.2418007E+06		1.0005308E+14	5.5407029E+07	-1.2868180E+07	4.1872493E+08
.9862954	8.6121605E+06		9.8510818E+05	1.8315264E+03	2.3123263E+02
.1310526	-.0342860	1.0002953E+07		9.9749443E+05	-6.3530632E+01
.0376662	.0370427	.0055808	9.9252616E+02		9.9797868E+05
.0343559	.0348488	-.0012881	.0018476	9.9874643E+02	
.0055478	-.0013798	.0419025	.0002332	-.0000637	9.9898883E+02

CARTESIAN FOR P AND Q PARAMETERS VEHICLES 2 AND 2

7.6105407E+13	-1.6283194E+13	4.5017313E+12	3.1528212E+08	-3.0292179E+08	1.3215736E+07
	3.5987853E+12	2.2521128E+12	-6.7717793E+07	6.7951823E+07	1.0692555E+07
8.7238413E+06		9.9558393E+13	1.7985515E+07	7.3710470E+07	4.1820160E+08
-.9842692	1.6970465E+06		9.9762234E+05	-1.3568203E+03	5.4543046E+01
.0517169	.1189798	9.9778952E+06		9.8498580E+05	5.4767227E+01
.0362981	-.0357389	.0018047	9.9881046E+02		9.9797595E+05
-.0349871	.0360918	.0074435	-.0013688	9.9246451E+02	
.0015164	.0056421	.0419553	.0000547	.0000552	9.9898746E+02

ORBIT PLNE FOR P AND Q PARAMETERS VEHICLES 2 AND 2

5.0341812E+12	1.9042550E+13	2.9387430E+12	8.3963136E+07	7.6918836E+07	1.2424516E+07
	7.4159327E+13	-2.9536373E+12	3.1664063E+08	2.9974748E+08	-1.1871329E+07

2.2436981E+06		1.0005908E+14	5.5405890E+07	-1.2868154E+07	4.1872493E+08
.9854816	8.6121616E+06		9.8511097E+05	1.8314611E+03	2.3123278E+02
.1309390	-.0342860	1.0002953E+07		9.9749443E+05	-6.3530635E+01
.0377035	.0370435	.0055807	9.9252757E+02		9.9797868E+05
.0343252	.0348488	-.0012881	.0018476	9.9874643E+02	
.0055431	-.0013798	.0419025	.0002332	-.0000637	9.9898883E+02

CARTESIAN FOR P PARAMETERS VEHICLES 3 AND 3

5.0629232E+13	-3.6557197E+13	8.4278945E+12	1.4277494E+08	-4.9555185E+08	3.5499598E+07
	7.2805002E+13	6.4011415E+12	3.4237504E+07	1.1819530E+09	2.7160446E+07
7.1154221E+06		9.8986190E+13	6.1108247E+07	1.3776983E+08	4.1398887E+08
-.6021277	8.5326433E+06		9.9620641E+05	-1.7982528E+03	2.5247148E+02
.1190505	.0754026	9.9491804E+06		1.0037179E+06	5.7554781E+02
.0201037	.0040202	.0061537	9.9810141E+02		9.9796212E+05
-.0695155	.1382645	.0138217	-.0017983	1.0018572E+03	
.0049942	.0031864	.0416528	.0002532	.0005751	9.9898054E+02

ORBIT PLNE FOR P PARAMETERS VEHICLES 3 AND 3

5.8638558E+13	3.8077557E+13	7.8605884E+12	1.0612888E+09	1.4011883E+08	3.3304398E+07
	6.4795676E+13	-7.0862562E+12	6.6990658E+08	2.6343999E+08	-2.9811547E+07
7.6575818E+06		9.8986190E+13	1.4674912E+08	-3.4343804E+07	4.1398887E+08
.6177334	8.0436383E+06		1.0027977E+06	3.8494283E+03	6.1253480E+02
.1031754	-.0884818	9.9491804E+06		9.9712662E+05	-1.4870627E+02
.1383996	.0831058	.0147293	1.0013979E+03		9.9796212E+05
.0183243	.0327741	-.0034568	.0030496	9.9856228E+02	
.0043536	-.0037072	.0416528	.0006123	-.0001411	9.9898054E+02

CARTESIAN FOR P AND Q PARAMETERS VEHICLES 3 AND 3

5.0630830E+13	-3.6555984E+13	8.4276196E+12	1.4278605E+08	-4.9552519E+08	3.5498540E+07
	7.2806923E+13	6.4009328E+12	3.4245938E+07	1.1819727E+09	2.7159649E+07
7.1155344E+06		9.8986237E+13	6.1106336E+07	1.3776539E+08	4.1398905E+08
-.6020944	8.5325973E+06		9.9620649E+05	-1.7980722E+03	2.5246418E+02
.1190447	.0753997	9.9491827E+06		1.0037183E+06	5.7553082E+02
.0201050	.0040211	.0061535	9.9810144E+02		9.9796212E+05
-.0695108	.1382659	.0138212	-.0017982	1.0018574E+03	
.0049940	.0031863	.0416528	.0002532	.0005751	9.9898054E+02

ORBIT PLNE FOR P AND Q PARAMETERS VEHICLES 3 AND 3

5.8639947E+13	3.8075304E+13	7.8603321E+12	1.0613136E+09	1.4011235E+08	3.3303411E+07

	6.4737806E+13	-7.0860351E+12	6.6988348E+08	2.6344511E+08	-2.9810664E+07
7.6576725E+06		9.8986237E+13	1.4674439E+08	-3.4341956E+07	4.1398985E+08
.6177004	8.0497084E+06		1.0027981E+06	3.0493235E+03	6.1251675E+02
.1031708	-.0884781	9.9491527E+06		9.9712664E+05	-1.4070227E+02
.1384013	.0831022	.0147288	1.0013981E+03		9.9796212E+05
.0183233	.0327744	-.0034567	.0030495	9.9856229E+02	
.0043535	-.0037071	.0416528	.0006123	-.0001410	9.9898054E+02

CARTESIAN FOR P PARAMETERS VEHICLES 2 AND 1

COVARIANCE

8.9345990E+06	-1.05965[illegible]2E+07	2.6064191E+06	-5.7085902E+05	6.7375314E+05	-1.3448435E+05
-1.0831504E+08	1.2823[illegible]72E+08	-2.9982556E+07	1.1551890E+05	-1.5208875E+05	2.8172856E+04
-2.4000922E+06	2.843[illegible]946E+06	-6.8108335E+05	1.3843679E+04	-1.7347943E+04	8.0536665E+03
2.4704883E+01	-2.9352397E+01	7.6393884E+00	1.5411378E+01	-1.8101439E+01	3.2920418E+00
-1.9641803E+03	2.3264094E+03	-5.5121137E+02	-3.5973200E+01	4.0461576E+01	2.8325075E+00
-4.6799327E+01	5.5381141E+01	-1.2793777E+01	2.2038050E+00	-2.5225904E+00	-3.9131161E-02

CORRELATION

.0000571	-.0031868	-.0000134	.0000014	-.0001103	-.0000026
-.0000593	.0033055	.0000139	-.0000814	.0001145	.0000027
.0000111	-.0005865	-.0000025	.0000003	-.0000206	-.0000005
-.0000991	.0000923	.0000021	.0000234	-.0000549	.0000033
.0001025	-.0001065	-.0000023	-.0000240	.0000541	-.0000034
-.0000155	.0000150	.0000008	.0000033	.0000029	-.0000080

ORBIT PLNE FOR P PARAMETERS VEHICLES 2 AND 1

COVARIANCE

-[illegible].9585977E+06	-1.7071423E+08	-3.8553223E+05	2.1637573E+04	2.2444095E+05	-6.0226233E+03
-4.2530105E+05	-7.8662167E+06	-1.4692637E+05	4.4653358E+04	8.8274587E+05	-2.0269566E+04
6.5781894E+04	1.2632631E+06	-2.4304708E+03	-2.4454433E+03	-5.6316699E+04	5.9439000E+03
-1.6285789E+02	-3.0901438E+03	-1.4150869E+01	-1.4279296E+00	-3.3534847E+01	1.2191114E+01
3.7535057E+00	7.2419108E+01	-3.1988955E-01	-1.0963108E+00	-2.1573836E+01	3.67498[illegible]6E-01
2.3497174E-02	-2.5852197E-01	3.8244596E-01	2.4532861E-01	6.4853808E+0[illegible]	-9.6722833E-01

CORRELATION

-.0013488	-.0000167	.0000022	-.0000554	.0000013	.0000000
-.0028138	-.0000338	.0000047	-.0001150	.0000027	-.0000000
-.0000064	-.0000006	-.0000000	-.0000005	-.0000000	.0000000
.0000885	.0000475	-.0000022	-.[illegible]132	-.0000101	.0000023

.0001005	.0001029	-.0000057	-.0000541	-.0000217	.0000065
-.0000027	-.0000024	.0000006	.0000124	.0000004	-.0000010

CARTESIAN FOR P AND Q PARAMETERS VEHICLES 2 AND 1

COVARIANCE

1.7929353E+09	-2.2310125E+09	1.2508071E+09	-4.2283156E+05	7.8356927E+05	-1.1023855E+05
-2.1709684E+10	2.6947660E+10	-1.4682790E+10	-1.6705065E+06	-1.4765808E+06	-2.6216529E+05
-4.8132437E+08	5.9814394E+08	-3.3032415E+08	-2.5820093E+04	-4.6767197E+04	1.5830111E+03
4.9646370E+03	-6.1954654E+03	3.5873131E+03	1.5822968E+01	-1.7795963E+01	3.3600461E+00
-3.9380451E+05	4.8912853E+05	-2.6849246E+05	-6.8400543E+01	1.6411591E+01	-2.4491887E+00
-9.3774215E+03	1.1633327E+04	-6.2961399E+03	1.4329710E+00	-3.0941809E+00	-1.6421889E-01

CORRELATION

.0008241	-.0458860	-.0001334	.0000199	-.0015910	-.0000376
-.0005701	.0483310	.0002040	-.0000211	.0016768	.0000396
.0003100	-.0157337	-.0000715	.0000078	-.0005849	-.0000136
-.0000734	-.0013329	-.0000039	.0000240	-.0001043	.0000022
.0001131	-.0010325	-.0000052	-.0000236	.0000219	-.0000041
-.0000127	-.0001391	.0000002	.0000034	-.0000025	-.0000002

ORBIT PLNE FOR P AND Q PARAMETERS VEHICLES 2 AND 1

COVARIANCE

-2.7339520E+09	-3.6620775E+10	-8.4749913E+09	2.2333139E+06	-8.1314371E+04	-2.6946647E+05
-1.2979681E+08	-1.6937524E+09	-4.2657753E+08	1.4698314E+05	8.6860064E+05	-3.2641239E+04
2.0074590E+07	2.7073002E+08	6.1238609E+07	-1.8794398E+04	-5.4056464E+04	7.8838342E+03
-4.9700173E+04	-6.6323391E+05	-1.5541071E+05	3.8629511E+01	-5.9072546E+01	7.4095292E+00
1.1454750E+03	1.5511296E+04	3.4602115E+03	-2.0329611E+00	-2.1444342E+01	4.7838349E-01
7.1896143E+00	-3.6703656E+01	9.4110508E+01	2.4743495E-01	6.4850854E+00	-9.6693755E-01

CORRELATION

-.0235277	-.0002910	.0000388	-.0009669	.0000221	.0000001
-.0412113	-.0004966	.0000583	-.0016872	.0000392	-.0000001
-.0083839	-.0001099	.0000136	-.0003475	.0000077	.0000002
.0083125	.0001528	-.0000168	.0003485	-.0000182	.0000022
-.0000354	.0001012	-.0000054	-.0000597	-.0000216	.0000065
-.0001209	-.0000038	.0000008	.0000075	.0000005	-.0000010

CARTESIAN FOR P PARAMETERS VEHICLES 3 AND 1

COVARIANCE

-4.7072220E+07	5.5719171E+07	-1.2973433E+07	-9.5853022E+05	1.1031335E+06	-9.3143039E+04
-3.5747314E+07	4.2308831E+07	-9.8167056E+06	7.6735628E+05	-8.8119579E+05	-1.3701253E+04
8.0924852E+06	-9.5814814E+06	2.2473430E+06	1.3403693E+04	-4.5173460E+03	-6.7029143E+04
-3.2652510E+02	3.8683540E+02	-9.2290060E+01	-2.1487343E+01	2.4755126E+01	-1.5277315E+00
-7.6135239E+02	9.0141211E+02	-2.1116079E+02	5.5762458E+00	-6.4083330E+00	-5.7775986E-01
3.0752677E+01	-3.6473753E+01	9.0181460E+00	2.3323757E+00	-2.6832796E+00	1.3464129E-01

CORRELATION

-.0003688	-.0002336	.0000453	-.0000182	-.0000424	.0000017
.0003825	.0002422	-.0000470	.0000189	.0000439	-.0000018
-.0000676	-.0000426	.0000084	-.0000034	-.0000078	.0000003
-.0002040	.0001362	.0000020	-.0000328	.0000084	.0000037
.0002057	-.0001370	-.0000005	.0000329	-.0000085	-.0000037
-.0000132	-.0000016	-.0000068	-.0000015	-.0000006	.0000001

ORBIT PLNE FOR P PARAMETERS VEHICLES 3 AND 1

COVARIANCE

-3.6119072E+06	-6.8997043E+07	-6.9181319E+04	3.1336702E+04	8.5621658E+05	-1.8235477E+05
3.2605465E+06	6.2210135E+07	9.9138303E+04	6.2719971E+04	1.6428049E+06	-1.9951150E+05
6.6836049E+05	1.2723825E+07	3.5376742E+04	-7.3386461E+03	6.6245082E+02	-6.8107833E+04
-6.6810547E+01	-1.2718436E+03	-3.5651900E+00	6.6506855E-02	2.0495404E+00	-1.2271795E+00
1.4944146E+01	2.8159102E+02	2.3602907E+00	1.2980074E+00	3.3492600E+01	-4.4945657E+00
2.5914387E+00	4.8484593E+01	5.9594340E-01	1.3417492E-01	3.5220987E+00	-4.8467717E-01

CORRELATION

-.0001592	.0001367	.0000227	-.0000225	.0000051	.0000009
-.0003329	.0002856	.0000473	-.0000469	.0000104	.0000018
-.0000003	.0000005	.0000001	-.0000001	.0000001	.0000000
.0000375	.0000714	-.0000068	.0000006	.0000119	.0000012
.0001122	.0002048	.0000001	.0000021	.0000337	.0000035
-.0000240	-.0000250	-.0000069	-.0000012	-.0000045	-.0000005

CARTESIAN FOR P AND Q PARAMETERS VEHICLES 3 AND 1

COVARIANCE

-9.4338096E+09	1.1707609E+10	-6.3640370E+09	-1.7344136E+06	5.2775640E+05	-2.1919405E+05
-7.1635924E+09	8.8857466E+09	-4.8224169E+09	1.7832682E+05	-1.3179879E+06	-1.0934715E+05
1.6221027E+09	-2.0137731E+09	1.0991525E+09	1.4688048E+05	9.4469452E+04	-4.5321068E+04

-6.5476689E+04	8.1352974E+04	-4.4829563E+04	-2.6881528E+01	2.0754286E+01	-2.4072221E+00
-1.5260734E+05	1.8944432E+05	-1.0332928E+05	-6.9801579E+00	-1.5720116E+01	-2.6195112E+00
6.1720029E+03	-7.6819708E+03	4.3192140E+03	2.8421303E+00	-2.3050970E+00	2.1819919E-01

CORRELATION

-.0053160	-.0033663	.0006537	-.0002630	-.0006108	.0000246
.0055981	.0035444	-.0006887	.0002773	.0006434	-.0000262
-.0019337	-.0012219	.0002389	-.0000971	-.0002230	.0000093
-.0003689	.0000316	.0000223	-.0000408	-.0000105	.0000043
.0000984	-.0002049	.0000126	.0000276	-.0000208	-.0000031
-.0000310	-.0000129	-.0000046	-.0000024	-.0000026	.0000002

ORBIT PLNE FOR P AND Q PARAMETERS VEHICLES 3 AND 1

COVARIANCE

-1.1022504E+09	-1.4794515E+10	-3.4006298E+09	9.2481217E+05	7.3269624E+05	-2.8865861E+05
9.9505863E+08	1.3342984E+10	3.0768329E+09	-7.4310476E+05	1.7542074E+06	-1.0358416E+05
2.0396584E+08	2.7297776E+09	6.3352011E+08	-1.7220284E+05	2.3454186E+04	-4.8460640E+04
-2.0388803E+04	-2.7286356E+05	-6.3333280E+04	1.6546038E+01	-2.2868040E-01	-3.1911187E+00
4.5605331E+03	6.0430028E+04	1.4460859E+04	-2.3557267E+00	3.3997695E+01	-4.0569125E+00
7.9086116E+02	1.0424517E+04	2.5428107E+03	-4.9554400E-01	3.6091494E+00	-4.0898026E-01

CORRELATION

-.0027793	.0023868	.0003958	-.0003931	.0000882	.0000153
-.0048782	.0041853	.0006928	-.0006880	.0001530	.0000263
-.0009857	.0008484	.0001413	-.0001404	.0000321	.0000056
.0010814	-.0008266	-.0001550	.0001479	-.0000211	-.0000040
.0000960	.0002187	.0000024	-.0000002	.0000342	.0000036
-.0000380	-.0000130	-.0000049	-.0000032	-.0000041	-.0000004

CARTESIAN FOR P PARAMETERS VEHICLES 3 AND 2

COVARIANCE

3.1709093E+13	-7.0437679E+12	-6.0675963E+12	1.2982352E+08	-1.3570345E+08	-2.7988726E+07
2.3788979E+13	-5.2853328E+12	-4.6791397E+12	1.0170649E+08	-9.7512713E+07	-2.1305368E+07
-5.4229338E+12	1.2042102E+12	1.0245682E+12	-2.2138259E+07	2.2273272E+07	4.7706077E+06
2.2762675E+08	-5.0548372E+07	-4.3062959E+07	9.0087824E+02	-8.6890320E+02	-2.0952304E+02
5.1910930E+08	-1.1537144E+08	-1.0112271E+08	2.1737610E+03	-2.1477007E+03	-4.5707086E+02
-2.1875391E+07	4.8618707E+06	4.2641136E+06	-9.8858506E+01	9.3499668E+01	1.8132437E+01

CORRELATION

.5108290	.3195837	-.0624798	.0261421	.0593944	-.0025101
-.5224418	-.3271035	.0638776	-.0267280	-.0607751	.0025685
-.0854628	-.0549602	.0103208	-.0043240	-.0101159	.0004278
.0182671	.0119339	-.0022278	.0009037	.0021723	-.0000991
-.0192156	-.0115150	.0022557	-.0008772	-.0021600	.0000943
-.0039375	-.0024995	.0004800	-.0002061	-.0004567	.0000182

ORBIT PLNE FOR P PARAMETERS VEHICLES 3 AND 2

COVARIANCE

-7.7038152E+12	-2.9331922E+13	-3.0946338E+12	-1.2612934E+08	-1.2118719E+08	-1.2869571E+07
7.0200599E+12	2.6802400E+13	2.6861559E+12	1.1953547E+08	1.0570563E+08	1.1696893E+07
1.4244650E+12	5.4397275E+12	5.3697096E+11	2.3170555E+07	2.1596085E+07	2.3862947E+06
-1.4528942E+08	-5.5441033E+08	-5.7692753E+07	-2.3652476E+03	-2.2481974E+03	-2.4034054E+02
3.3283377E+07	1.2717354E+08	1.2047932E+07	4.7293946E+02	4.7016263E+02	6.5628846E+01
5.7537103E+06	2.1953896E+07	2.2966167E+06	9.7430944E+01	9.6399917E+01	7.6318236E+00

CORRELATION

-.4487632	.3890160	.0638557	-.0647188	.0148681	.0025692
-.4456811	.3856208	.0634560	-.0642854	.0147880	.0025518
-.0404007	.0333600	.0053355	-.0057595	.0012062	.0002298
-.0165952	.0149616	.0023464	-.0023797	.0004772	.0000983
-.0158456	.0131482	.0021734	-.0022479	.0004714	.0000966
-.0016823	.0014546	.0002401	-.0002402	.0000658	.0000076

CARTESIAN FOR P AND Q PARAMETERS VEHICLES 3 AND 2

COVARIANCE

3.1708788E+13	-7.0400897E+12	-6.0675145E+12	1.2982267E+08	-1.3563666E+08	-2.7987139E+07
2.3785748E+13	-5.2857404E+12	-4.6791277E+12	1.0170585E+08	-9.7462013E+07	-2.1304163E+07
-5.4228814E+12	1.2035774E+12	1.0245541E+12	-2.2138113E+07	2.2261783E+07	4.7703346E+06
2.2762463E+08	-5.0522799E+07	-4.3062391E+07	9.0087235E+02	-8.6843889E+02	-2.0551200E+02
5.1910437E+08	-1.1531191E+08	-1.0112139E+08	2.1737473E+03	-2.1466199E+03	-4.5704517E+02
-2.1875131E+07	4.8594540E+06	4.2640600E+06	-9.8857949E+01	9.3455788E+01	1.8131394E+01

CORRELATION

.5108159	.3195785	-.0624791	.0261419	.0593938	-.0025101
-.5215451	-.3255439	.0637589	-.0266830	-.0606723	.0025642
-.0854603	-.0549591	.0103207	-.0043240	-.0101158	.0004278
.0182657	.0119337	-.0022278	.0009037	.0021723	-.0000991
-.0192068	-.0115089	.0022545	-.0008767	-.0021589	.0000943

```
   -.0039372      -.0024993       .0004800      -.0002061      -.0004567       .0000182


ORBIT PLNE   FOR   P AND Q  PARAMETERS     VEHICLES    3  AND   2

   COVARIANCE
 -7.7003770E+12 -2.9391763E+13 -3.0946592E+12 -1.2606707E+08 -1.2118864E+08 -1.2869568E+07
  7.0169590E+12  2.6802257E+13  2.6861788E+12  1.1947931E+08  1.0570694E+08  1.1696890E+07
  1.4238306E+12  5.4396981E+12  5.3697565E+11  2.3159065E+07  2.1596353E+07  2.3862941E+06
 -1.4522600E+08 -5.5440740E+08 -5.7693221E+07 -2.3640991E+03 -2.2482243E+03 -2.4034048E+02
  3.3269319E+07  1.2717289E+08  1.2048036E+07  4.7268483E+02  4.7015859E+02  6.5628833E+01
  5.7512874E+06  2.1953784E+07  2.2966346E+06  9.7387060E+01  9.6400943E+01  7.6318213E+00

   CORRELATION
   -.4481783       .3895119       .0637832      -.0646358       .0148492       .0025659
   -.4455734       .3855153       .0634855      -.0642851       .0147879       .0025518
   -.0404006       .0333600       .0053956      -.0057596       .0012062       .0002298
   -.0165858       .0149544       .0023453      -.0023786       .0004769       .0000982
   -.0153456       .0131483       .0021734      -.0022479       .0004714       .0000966
   -.0015823       .0014546       .0002401      -.0002402       .0000658       .0000076

 COVARIANCE MATRICES AT     3.000000000E+01     MINUTES FROM MIDNIGHT OF EPOCH DATE


     ATA(INVERSE) FOR      P      PARAMETERS

            0001 X      0001 Y      0001 Z      0001 DX     0001 DY     0001 DZ     0002 X      0002 Y
            0002 Z      0002 DX     0002 DY     0002 DZ     0003 X      0003 Y      0003 Z      0003 DX
            0003 DY     0003 DZ
0001 X      2.74180E+08
0001 Y     -2.37417E+08 2.61362E+08
0001 Z     -6.54772E+08 2.37305E+08 3.50382E+09
0001 DX    -8.69884E+04 3.07262E+04 4.66406E+05 7.26134E+01
0001 DY     5.22055E+04-3.35431E+04-1.89425E+05-3.14774E+01 1.63858E+01
0001 DZ     4.64280E+05-1.97344E+05-2.31868E+06-3.43168E+02 1.43736E+02 1.71392E+03
0002 X     -1.85173E+07 1.56370E+07 4.16309E+07 1.12133E+04-7.75487E+03-3.86454E+04 5.06787E+13
0002 Y     -5.03252E+07 6.64376E+07-1.32954E+07-3.29124E+03-3.08653E+03-1.07060E+03-1.43006E+13 4.16315E+12

0002 Z     -1.71157E+05 1.25592E+06-5.48692E+06-1.46479E+03 7.28133E+02 4.45781E+03 3.62444E+12 2.34449E+12
            9.85472E+13
0002 DX     3.60854E+01-3.37343E+02 1.54137E+03 4.13523E-01-2.07000E-01-1.26241E+00 4.50141E+08-2.20514E+08
            3.29638E+08 8.72337E+05
0002 DY     3.44505E+03-2.84389E+03-8.04082E+03-2.22292E+00 1.52633E+00 7.52866E+00 3.84385E+09-1.08679E+09
```

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         -3.51[illegible]3E+07-3.70372E+04 2.99027E+05
0002 DZ  -4.55852E+01 1.17303E+02-3.13700E+02-3.47468E-02 3.84016E-02 2.48984E-01-1.53085E+08 4.02533E+07
         -7.89603E+07 3.16345E+04 1.41218E+04 9.92108E+05
0003 X   -3.55108E+07 3.76303E+07 3.94439E+07 1.08078E+04-9.44705E+03-4.10669E+04 2.38545E+13-6.74867E+12
         -2.80187E+12-9.38355E+08 1.92545E+09 2.31143E+08 3.02421E+13
0003 Y   -2.10340E+07 3.00351E+07-1.71637E+07-4.61548E+03 5.65540E+01 9.35131E+03 1.29090E+13-4.16280E+12
         -8.14749E+12 1.82341E+09 8.53245E+08-4.43865E+08-2.15923E+13 5.10374E+13
0003 Z    4.70780E+06-6.84365E+06 4.56746E+06 1.17826E+03-7.34020E+01-2.62447E+03-2.97035E+12 9.60224E+11
          1.89887E+12-4.32374E+08-1.95242E+08 1.06393E+08 4.82736E+12 1.12205E+13 9.74309E+13
0003 DX   2.26548E+02 2.89296E+02-3.03924E+03-3.25889E-01 4.48828E-01 2.57250E+00-1.95255E+08 1.84893E+07
         -4.61286E+08 1.73355E+05-2.31394E+04-4.23551E+04 1.48221E+09-2.47399E+09 5.85095E+08 7.55464E+05
0003 DY   2.48501E+02 2.56374E+02-3.00774E+03-3.25977E-01 4.53270E-01 2.56631E+00-2.46944E+08 3.39029E+07
         -4.46317E+08 1.71385E+05-3.29838E+04-4.19965E+04 1.58233E+09-2.35980E+09 5.67950E+08-2.42572E+05
          7.58917E+05
0003 DZ  -6.15863E+01-5.62169E+01 7.06221E+02 1.94413E-01-1.07191E-01-6.03533E-01 5.68677E+07-7.54846E+06
          1.06012E+08-4.07343E+04 7.69474E+03 9.95464E+03-3.80461E+08 5.58212E+08-1.34627E+08 5.74956E+04
          5.72059E+04 9.86+48E+05
```

CORRELATION MATRIX

0001 X	1.000															
0001 Y	-.887	1.000														
0001 Z	-.658	.249	1.000													
0001 DX	-.617	.223	.325	1.000												
0001 DY	.779	-.512	-.791	-.913	1.000											
0001 DZ	.677	-.294	-.946	-.973	.858	1.000										
0002 X	-.000	.000	.000	.000	-.000	-.000	1.000									
0002 Y	-.001	.002	-.000	-.000	-.000	-.000	-.985	1.000								
0002 Z	-.000	.000	-.000	-.000	.000	.000	.051	.116	1.000							
0002 DX	.000	-.000	.000	.000	-.000	-.000	.068	-.116	.036	1.000						
0002 DY	.000	-.000	-.000	-.000	.001	.000	.987	-.974	-.006	-.073	1.000					
0002 DZ	-.000	.000	-.000	-.000	.000	.000	-.022	.020	-.008	.034	.026	1.000				
0003 X	-.000	.000	.000	.000	-.000	-.000	.609	-.601	-.051	-.183	.640	.042	1.000			
0003 Y	-.000	.000	-.000	-.000	.000	.000	.254	-.286	-.115	.274	.218	-.062	-.550	1.000		
0003 Z	.000	-.000	.000	.000	-.000	-.000	-.042	.048	.019	-.047	-.036	.011	.089	.159	1.000	
0003 DX	.000	.000	-.000	-.000	.000	.000	-.032	.010	-.053	.214	-.061	-.049	.310	-.398	.068	1.000

```
0003 DY      .000     .000    -.000    -.000     .000     .080    -.040     .019    -.052     .211    -.069    -.048
             .330    -.379     .066    -.320    1.000
0003 DZ     -.000    -.000     .000     .000    -.000    -.000     .008    -.004     .011    -.044     .014     .010
            -.070     .079    -.014     .067     .066    1.000

SQRT DIAG    1.655839E+04     1.617287E+04     5.919305E+04     8.521352E+00     4.047937E+00     4.139949E+01
             7.118896E+06     2.040379E+06     9.927094E+06     9.339897E+02     5.468333E+02     9.960463E+02
             5.499283E+06     7.144043E+06     9.870707E+06     8.691744E+02     8.711585E+02     9.932010E+02

PIVOT RATIOS
             1.000000E+00     4.816559E+00     2.595729E+02     1.104760E+01     8.856481E+03     4.384970E+05
             1.084038E+00     1.706543E+03     2.332865E+05     3.553952E+05     9.176784E+08     8.817966E+08
             5.163285E+11     4.367208E+11     9.103338E+10     3.629283E+10     2.861656E+10     2.029161E+09

A PIVOT RATIO EXCEEDS 10**5.
CHECK ATA MATRIX FOR ILL CONDITIONING.


             DPDQ MATRIX

            3  RBIA      3  ALT       3  LONG      3  LAT       2  RBIA      2  ALT       2  LONG      2  LAT
            1  EBIA      1  ABIA      1  RBIA      1  ALT       1  LONG      1  LAT          GM           02,00
0001 X    -1.36186E-07-9.82418E-08-1.07344E-02 2.77248E-02-7.90201E-08-5.34169E-08-1.28714E-02 1.69283E-02
          -3.04655E+05 1.12220E+06 7.04946E-01-3.32361E-01 1.67562E+06-3.88605E+05-7.37786E+08 1.19618E+05
0001 Y     2.42393E-07 1.77291E-07 1.86347E-02-5.04820E-02 2.33144E-07 1.66317E-07 2.80470E-02-4.42651E-02
           7.74029E+05-1.33554E+06 7.17292E-01-7.00006E-01-1.99861E+06 4.68807E+05 9.83876E+08-1.59587E+05
0001 Z     1.30531E-07 1.04323E-07 9.37512E-03-2.42138E-02-7.53989E-08-3.95194E-08-3.99831E-03 1.77770E-02
          -2.25138E+06-5.66948E+05 7.90663E-02 7.00460E-01-2.17880E+01 2.65776E+06-2.39037E+00 3.90565E+04
0001 DX    5.24020E-11 4.36571E-11 3.99190E-06-1.11526E-05-1.41389E-11-7.45217E-12-1.27020E-06 3.95540E-06
          -4.95094E+01 7.98241E+01 1.56679E-05 1.76723E-06 1.22609E+02-1.68258E+01 4.87537E+05-7.90119E+01
0001 DY   -3.35414E-11-3.04562E-11-3.03000E-06 7.44403E-05-3.54277E-12-5.29331E-12-1.12258E-06-1.46189E-07
          -6.01379E+01 6.02604E+01-3.46392E-05 3.89463E-05 1.02787E+02 2.23995E+00-7.78884E+05 1.26362E+02
0001 DZ   -2.26479E-10-1.67423E-10-1.64880E-05 4 52137E-05-1.58214E-11-1.82432E-11-4.33584E-06-5.18667E-07
           9.27173E+00-1.91976E+01 7.74036E-06-1 16702E-05 1.53276E-02 2.88572E+01 1.78814E+05-2.93748E+01
0002 X     1.88921E-01 1.39187E-01 1.43891E+04-4.03207E+04-2.20610E-01-1.60751E-01-2.80761E+04 4.08919E+04
           7.70703E+04-1.10193E+04 1.45223E-01-1.08223E-01-3.43916E+04-2.38224E+04 1.33414E+08-4.29233E+03
0002 Y    -5.59664E-02-4.16028E-02-3.95103E+03 1.18111E+04-4.72274E-01-3.26487E-01-5.96598E+04 9.46643E+04
           2.59128E+05-3.66515E+05 4.69449E-01-3.77849E-01-5.38421E+05 1.52401E+05 1.43130E+08-2.51173E+04
0002 Z    -5.25513E-02-3.93329E-02-3.95516E+03 1.07647E+04 1.87907E-02 1.27759E-02 2.26058E+03-3.89874E+03
           3.12906E+03-1.57148E+04 1.93967E-03-3.13514E-03-2.12576E+04 9.00187E+03 1.37964E+07-5.05363E+03
0002 DX    1.68880E-07 3.60608E-07 6.53070E-03-2.86625E-02 2.57045E-06 2.10727E-06 3.28304E-01-3.78436E-01
          -7.64613E-01 4.36583E+00-2.08567E-06 1.80642E-06 5.72372E+00-2.99631E+00-2.96219E+03 1.29209E+00
0002 DY    1.48873E-05 1.09119E-05 1.11541E+00-3.17868E+00-2.71561E-06-5.92073E-07-3.27181E-01 1.10693E+00
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          -1.48013E+01 5.67442E-01-2.40011E-05 1.00242E-05 4.86647E+00 6.40969E+00-2.33805E+04 2.54448E-01
0002 DZ   -2.02159E-07-1.98434E-07-1.49435E-02 5.38782E-02-9.93411E-07-7.70007E-07-1.25535E-01 1.59639E-01
           3.41740E-01-1.14939E+00 5.58461E-07-5.11778E-07-1.56746E+00 6.65707E-01 1.12404E+03-3.63706E-01
0003 X    -4.52332E-01-3.45528E-01-3.39708E+04 9.50312E+04 2.45970E-01 1.68943E-01 3.07509E+04-4.87076E+04
           1.64714E+05-1.27533E+05 3.04479E-01-2.35827E-01-2.06857E+05 2.24005E+04 9.86071E+07 4.10602E+03
0003 Y    -3.12820E-01-2.35001E-01-2.33405E+04 6.64257E+04 6.25801E-02 3.91121E-02 8.00472E+03-1.48663E+04
           1.11264E+05-1.85811E+05 2.01251E-01-1.64122E-01-2.67674E+05 8.59450E+04 1.26004E+00-2.98046E+00
0003 Z     7.75337E-02 5.98831E-02 6.06188E+03-1.67792E+04-6.11210E-03-3.06940E-03-7.56864E+02 1.71574E+03
          -2.55452E+04 4.29593E+04-4.08348E-02 3.43725E-02 6.23106E+04-1.05604E+04-3.65000E+07 0.27783E+03
0003 DX   -2.85308E-06-2.37326E-06-2.44175E-01 5.30212E-01-7.73917E-06-5.67014E-06-9.75341E-01 1.39904E+00
          -6.21898E-02-6.75362E+00 2.09376E-07-5.39953E-07-8.58990E+00 4.97702E+00 4.75360E+03-2.40246E+00
0003 DY    1.53581E-06 1.06196E-06 8.23593E-02-3.68984E-01-4.02431E-06-3.09770E-06-5.07052E-01 6.53160E-01
          -2.74237E-01-6.62721E+00 8.18641E-07-9.57218E-07-8.28604E+00 5.23600E+00 1.72556E+03-1.04086E+00
0003 DZ    4.76837E-07 3.81470E-07 4.06354E-02-1.10296E-01 1.71264E-06 1.25716E-06 2.15830E-01-3.07555E-01
           8.04524E-02 1.53335E+00 3.27587E-07-1.03958E-07 1.96453E+00-1.09846E+00-1.07498E+03 5.61272E-01
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ATA(INVERSE) FOR P AND Q PARAMETERS

```
0001 X     0001 Y     0001 Z     0001 DX    0001 DY    0001 DZ    0002 X     0002 Y
0002 Z     0002 DX    0002 DY    0002 DZ    0003 X     0003 Y     0003 Z     0003 DX
0003 DY    0003 DZ
```

CORRELATION MATRIX

0001 X	1.000											
0001 Y	-.966	1.000										
0001 Z	.012	-.270	1.000									
0001 DX	.852	-.904	.323	1.000								
0001 DY	.855	-.945	.471	.776	1.000							
0001 DZ	-.053	.087	-.140	-.493	.103	1.000						
0002 X	-.001	.001	-.002	-.001	-.002	-.000	1.000					
0002 Y	-.041	.044	-.016	-.040	-.042	.004	-.984	1.000				
0002 Z	-.000	.000	.000	-.000	-.000	.000	.051	.116	1.000			
0002 DX	.001	-.001	-.000	.001	.001	-.000	.068	-.116	.036	1.000		
0002 DY	.002	-.003	.005	.003	.004	.000	.987	-.973	-.006	-.073	1.000	
0002 DZ	-.000	.000	-.000	-.000	-.000	.000	-.022	.020	-.000	.034	.026	1.000
0003 X	-.006	.007	-.005	-.006	-.007	.001	.609	-.601	-.051	-.183	.640	.042
	1.000											
0003 Y	-.006	.006	-.002	-.006	-.006	.001	.254	-.285	-.115	.274	.218	-.062

```
                -.550    1.000
0003 Z           .001    -.001     .000     .001     .001    -.000    -.042     .048     .019    -.047    -.036     .011
                 .089     .159    1.000
0003 DX         -.001     .001     .000    -.001    -.001     .000    -.032     .010    -.053     .214    -.061    -.049
                 .310    -.398     .068    1.000
0003 DY         -.001     .001     .000    -.001    -.001     .000    -.040     .019    -.052     .211    -.069    -.048
                 .330    -.379     .066    -.320    1.000
0003 DZ          .000    -.000    -.000     .000     .000    -.000     .008    -.004     .011    -.044     .014     .010
                -.070     .079    -.014     .067     .066    1.000

SQRT DIAG      2.331531E+05    3.093228E+05    4.680919E+05    2.062853E+01    1.750148E+01    4.161849E+01
               7.118913E+06    2.042353E+06    9.927094E+06    9.339901E+02    5.468413E+02    9.960463E+02
               5.499440E+06    7.144174E+06    9.870712E+06    8.691755E+02    8.711595E+02    9.932011E+02

          STATE COVARIANCE AND CORRELATION MATRIX PARTITIONS AT      3.000000000E+01    MMOED

          CARTESIAN    FOR      P      PARAMETERS     VEHICLES     1   AND    1
            1.9378948E+08 -1.8778916E+08 -9.2356584E+07  4.2205168E+04 -3.3341856E+03 -1.5358588E+05
                           1.9162336E+08  9.1805733E+06 -2.4879282E+04 -5.0279636E+03  6.4513164E+04
            1.3920829E+04                 7.1258805E+08 -1.5345976E+05  7.0338859E+04  7.7506512E+05
            -.9744986      1.3842809E+04                 7.2405166E+01 -3.1832935E+01 -3.4423029E+02
            -.2485329       .0248443      2.6694345E+04                 1.6839958E+01  1.4584082E+02
             .3562999      -.2112170      -.6756013      8.5091275E+00                 1.7256827E+03
            -.0583652      -.0885110       .6421342      -.9116359      4.1036518E+00
            -.2655849       .1121873       .6989377      -.9738315       .8555160      4.1541338E+01

          ORBIT PLNE   FOR      P      PARAMETERS     VEHICLES     1   AND    1
            7.5416975E+06  1.8191153E+07  6.8709125E+07  5.9283546E+03 -2.2023952E+03  7.5866952E+04
                           3.6526704E+08 -1.2824916E+07 -2.4087103F+04  2.3470338E+03 -1.9970407E+04
            2.7462151E+03                 7.2519215E+08  7.5337464E+03 -2.4320681E+04  8.0396694E+05
             .3465935      1.9111961E+04                 1.7323869E+01 -4.0186420E+00  1.6865922E+02
             .9290804      -.0249185      2.6929392E+04                 7.9231670E+00 -4.9077642E+01
             .5186533      -.3028007       .6721435      4.1621952F+00                 1.7896808E+03
            -.2849125       .0436279      -.3208483      -.3430105      2.8148121E+00
             .6530257      -.0246998       .7057061       .9578552      -.4121416      4.2304619E+01

          CARTESIAN    FOR   P AND Q  PARAMETERS     VEHICLES     1   AND    1
            6.9493670F+10 -7.1830395E+10  4.2433111E+09  4.2629431E+06  4.4721147E+06 -1.3030894E+06
                           7.7301799E+10 -2.9825505E+10 -4.6071619E+06 -5.0536823E+06  1.4814488E+06
            2.6361652F+05                 2.1202344E+11  1.9324431E+06  3.8624062E+06 -1.1995292E+06
```

-.9800333	2.7803201E+05		3.4519835E+02	2.7106465E+02	-4.3066653E+02
.0349575	-.2329706	4.6046104E+05		3.6431550E+02	3.9940895E+01
.8703673	-.8918757	.2258814	1.8579514E+01		1.7619041E+03
.8887948	-.9523012	.4394679	.7643631	1.9087051E+01	
-.1177634	.1259406	-.0620523	-.5522244	.0498526	4.1975041E+01

ORBIT PLNE FOR P AND Q PARAMETERS VEHICLES 1 AND 1

2.6202313E+09	1.1432274E+10	2.1031839E+10	-7.5854122E+05	-1.6429767E+05	-1.5345161E+05
	1.5434906E+11	3.3389114E+10	-9.8017970E+06	-6.6493119E+05	-1.8663139E+06
5.1188135E+04		2.0124362E+11	-2.4816375E+06	-1.3476150E+05	-5.6679600E+05
.5673726	3.9363569E+05		6.3680297E+02	4.0897672E+01	2.8767719E+02
.9158828	.1830788	4.4860854E+05		1.7995868E+01	-3.5179945E+01
-.5872281	-.9857535	-.2192140	2.5234955E+01		1.8166191E+03
-.7566154	-.3981950	-.7081282	.3820407	4.2421537E+00	
-.0703347	-.1112393	-.0296434	.2674675	-.1945704	4.2621815E+01

CARTESIAN FOR P PARAMETERS VEHICLES 2 AND 2

5.4232313E+13	-8.0642703E+12	3.9686477E+12	1.5211476E+09	3.4773012E+09	-1.4371358E+08
	1.2933865E+12	2.4813391E+12	-2.1902841E+08	-5.2168989E+08	4.5161370E+07
7.3642592E+06		9.9779704E+13	3.4338042E+08	1.0481017E+08	7.6011696E+08
-.9625553	1.1375362E+06		8.5404882E+05	-7.6397188E+04	2.9573657E+04
.0539501	.2183734	9.9889791E+06		2.6136268E+05	1.4363980E+04
.2235120	-.2083502	.0371974	9.2414762E+02		9.8564079E+05
.9235150	-.8970681	.0205239	-.1617016	5.1123642E+02	
-.0196556	.0339892	.0766479	.0322353	.0283005	9.9279444E+02

ORBIT PLNE FOR P PARAMETERS VEHICLES 2 AND 2

3.6829691E+12	1.3463305E+13	3.9702101E+12	-8.2344615E+08	4.5444216E+08	7.1922790E+07
	5.1631479E+13	-6.9103222E+11	-3.2118127E+09	1.8109750E+09	1.5259108E+08
1.9191063E+06		9.9991558E+13	3.8165580E+08	-4.5264635E+08	7.7204580E+08
.9763272	7.1855048E+06		2.8421278E+05	1.3576694E+05	2.2111891E+04
.2068868	-.0096174	9.9995779E+06		8.2789488E+05	-2.2259905E+04
-.8048489	-.8384383	.0715926	5.3311611E+02		9.8894463E+05
.2602507	.2759922	-.0497496	.2798882	9.0988729E+02	
.0376851	.0213543	.0776382	.0417079	-.0246008	9.9445695E+02

CARTESIAN FOR P AND Q PARAMETERS VEHICLES 2 AND 2

5.4232538E+13	-8.0635165E+12	3.9686515E+12	1.5211418E+09	3.4772715E+09	-1.4371197E+08
	1.3017608E+12	2.4816414E+12	-2.1911644E+08	-5.2169022E+08	4.5184722E+07

7.3642744E+06		9.9779717E+13	3.4377671E+08	1.8481321E+08	7.6011794E+08
-.9595855	1.1409473E+06		8.5404987E+05	-7.6397725E+04	2.9573381E+04
.0539502	.2177471	9.9889798E+06		2.6136848E+05	1.4364187E+04
.2235106	-.2079106	.0371970	9.2414819E+02		9.8564087E+05
.9235960	-.8943767	.0205243	-.1617088	5.1124218E+02	
-.0196564	.0338902	.0766479	.0322329	.8283004	9.9279447E+02

ORBIT PLNE FOR P AND Q PARAMETERS VEHICLES 2 AND 2

3.6905235E+12	1.3461816E+13	3.9703971E+12	-8.2343386E+08	4.5453006E+08	7.1938398E+07
	5.1631930E+13	-6.9106564E+11	-3.2117847E+09	1.8189572E+09	1.5258771E+08
1.9210735E+06		9.9991562E+13	3.8165557E+08	-4.5264418E+08	7.7204618E+08
.9752153	7.1855362E+06		2.8421865E+05	1.3576699E+05	2.2111861E+04
.2066847	-.0096179	9.9995781E+06		8.2789591E+05	-2.2259723E+04
-.8040045	-.8384187	.0715920	5.3312168E+02		9.8894466E+05
.2600344	.2759881	-.0497493	.2798853	9.0938785E+02	
.0375557	.0213538	.0776382	.0417074	-.0246006	9.9445697E+02

CARTESIAN FOR P PARAMETERS VEHICLES 3 AND 3

3.7245357E+13	-2.3810105E+13	5.3646343E+12	2.3848586E+09	8.6035994E+08	-3.2538613E+08
	4.6287769E+13	1.3549892E+13	-2.5138399E+09	-2.8103371E+08	5.4426187E+08
6.1029793E+05		9.8460349E+13	7.0947847E+08	9.2211095E+08	7.8328052E+08
-.5734378	6.8035115E+06		6.9611045E+05	-2.9547439E+05	5.7171170E+04
.0885865	.2007114	9.9227188E+06		7.2506712E+05	5.8256413E+04
.4683604	-.4428589	.0856378	8.3433234E+02		9.8897333E+05
.1655576	-.0455105	.1091348	-.4159026	8.5158873E+02	
-.0538173	.0807693	.0715598	.0691846	.0690758	9.9044898E+02

ORBIT PLNE FOR P PARAMETERS VEHICLES 3 AND 3

4.0403480E+13	2.4137076E+13	1.4101305E+13	-4.4124417E+05	2.1674425E+09	5.0864285E+08
	4.3131646E+13	-3.6762375E+12	-1.2067573E+09	2.5450611E+09	3.8918487E+08
6.3563732E+06		9.8460349E+13	1.8015768E+09	-5.9282378E+08	7.8328052E+08
.5796429	6.5673927E+06		6.5327743E+05	2.9822430E+05	6.4779147E+04
.2235824	-.0554140	9.9227188E+06		7.6790014E+05	-4.9658983E+04
-.0858857	-.2273412	.1248834	8.0825579E+02		9.8097333E+05
.3891220	.4522347	-.0680857	.4097628	8.7629912E+02	
.0795224	.0598198	.0715598	.0809204	-.8572159	9.9044098E+02

CARTESIAN FOR P AND Q PARAMETERS VEHICLES 3 AND 3

3.7248213E+13	-2.3808235E+13	5.3642157E+12	2.3848819E+09	8.6043756E+08	-3.2531024E+08

	4.6289908E+13	1.3549412E+13	-2.5137905E+09	-2.8093463E+08	5.4425434E+08
6.1031314E+06		9.8460456E+13	7.0946735E+08	9.2208869E+08	7.0328222E+08
-.5733652	6.3035687E+06		6.9611223E+05	-2.9547162E+05	5.7170863E+04
.0885773	.2006995	9.9227242E+06		7.2507207E+05	5.8255964E+04
.4683543	.4428394	.0876953	8.3433341E+02		9.8097338E+05
.1655679	-.0484922	.1091318	-.4158968	8.5151164E+02	
-.0538156	.0807663	.0715500	.0691841	.0690750	9.9044100E+02

ORBIT PLNE FOR P AND Q PARAMETERS VEHICLES 3 AND 3

4.0406066E+13	2.4195296E+13	1.4101377E+13	-4.4113075E+08	2.1674032E+09	5.0063408E+08
	4.3132055E+13	-3.6759404E+12	-1.2068248E+09	2.5450780E+09	3.8910804E+08
6.3565756E+06		9.8460456E+13	1.0015534E+09	-5.9201545E+08	7.0328222E+08
.5795723	6.5674999E+06		6.5328301E+05	2.9022200E+05	6.4778664E+04
.2235668	-.0564076	9.9227242E+06		7.6790130E+05	-4.9658733E+04
-.0858605	-.2273492	.1248799	8.0825925E+02		9.8097338E+05
.3891022	.4422301	-.0680847	.4097575	8.7629978E+02	
.0795186	.0598193	.0715500	.0809194	-.0572156	9.9044100E+02

CARTESIAN FOR P PARAMETERS VEHICLES 2 AND 1

COVARIANCE

3.1232090E+06	2.9449001E+05	-2.9135322E+07	1.1909740E+04	-8.1240811E+03	-4.0640668E+04
-5.7815657E+07	5.3950272E+07	-5.3566248E+06	-6.9105460E+03	-1.5820805E+03	1.2684075E+04
-3.1591471E+06	2.9093619E+06	2.7709021E+06	-1.5894972E+03	7.7654782E+02	4.8814804E+03
8.1295620E+02	-7.7942765E+02	-4.5706182E+02	3.0540392E-01	-1.2608278E-01	-8.9877067E-01
-1.6500722E+03	1.0481929E+03	5.3717277E+03	-2.3378132E+00	1.4914903E+00	7.6940044E+00
-2.1045612E+02	2.0354249E+02	1.0370547E+02	-7.3030366E-02	2.8508172E-02	2.1078724E-01

CORRELATION

.0000305	-.0036511	-.0000227	.0000632	-.0002319	-.0000152
.0000029	.0038091	.0000210	-.0000609	.0001481	.0000148
-.0001482	-.0001764	.0000104	-.0000185	.0003936	.0000039
.0001901	-.0007139	-.0000187	.0000388	-.0005374	-.0000086
-.0002688	-.0003389	.0000189	-.0000332	.0007109	.0000070
-.0001326	.0002684	.0000118	-.0000234	.0003623	.0000051

ORBIT PLNE FOR P PARAMETERS VEHICLES 2 AND 1

COVARIANCE

-3.2101955E+06	-8.2249597E+07	1.2148580E+07	6.4650181E+03	-2.4010691E+03	1.7431795E+04

3.2847022E+06	1.1240000E+07	2.8084919E+07	2.5264149E+03	-6.8370488E+03	4.1128104E+04
-3.5453554E+04	-2.1195159E+06	8.0711496E+05	2.2524963E+02	-1.8921858E+02	1.2019700E+03
4.8391383E+02	-1.0633869E+03	5.6521594E+03	6.9654083E-01	-1.3624322E+00	8.0928454E+00
-4.3420236E+01	-9.4392402E+02	7.0660722E+01	6.7854990E-02	-1.0115450E-02	1.1438717E-01
-1.1312092E+01	-1.6099321E+02	-2.8776739E+01	6.7724037E-03	8.0499974E-03	-4.1385660E-02

CORRELATION

-.0005031	.0001665	-.0000013	.0003305	-.0000174	-.0000041
-.0022425	.0000818	-.0000111	-.0001050	-.0000543	-.0000085
.0002351	.0001451	.0000030	.0003937	.0000029	-.0000011
.0008094	.0007845	.0000054	.0003139	.0000179	.0000016
-.0004445	-.0003380	-.0000067	-.0009079	-.0000039	.0000029
.0002147	.0001353	.0000028	.0003588	.0000030	-.0000010

CARTESIAN FOR P AND Q PARAMETERS VEHICLES 2 AND 1

COVARIANCE

-1.3072635E+09	2.1359723E+09	-6.6122571E+09	-1.2402219E+05	-2.0094045E+05	3.9787840E+04
-2.2436245E+10	2.4434244E+10	-1.2137929E+10	-1.4625283E+06	-1.6254091E+06	4.8064544E+05
-9.6219838E+08	9.7711148E+08	8.6431540E+07	-5.8759995E+04	-5.8768303E+04	1.9494230E+04
2.6993597E+05	-2.8155152E+05	3.8531765E+04	1.6887681E+01	1.7622769E+01	-5.5625344E+00
-1.6868081E+05	4.5522667E+04	1.0621093E+06	-3.2982160E+00	8.4643878E+00	8.4311686E-01
-7.1151417E+04	7.4590888E+04	-1.3059782E+04	-4.4690406E+00	-4.6981252E+00	1.4661769E+00

CORRELATION

-.0006734	-.0745954	-.0003654	.0011080	-.0012516	-.0002719
.0010432	.0771838	.0003518	-.0010962	.0003203	.0002702
-.0019500	-.0231040	.0000188	.0000905	.0045118	-.0000286
-.0009054	-.0653929	-.0003166	.0009835	-.0003472	-.0002423
-.0014295	-.0745377	-.0003082	.0009991	.0008674	-.0002479
.0001285	.0100362	.0000465	-.0001434	.0000393	.0000352

ORBIT PLNE FOR P AND Q PARAMETERS VEHICLES 2 AND 1

COVARIANCE

-2.3483103E+09	-3.4215789E+10	-5.5318356E+09	2.1612656E+06	1.3376933E+05	4.1591467E+05
1.0115464E+09	6.9751266E+09	6.6956334E+09	-4.4987975E+05	-6.8392068E+04	-6.8014209E+04
-4.9714549E+07	-8.4327316E+08	-5.1046140E+07	5.3131244E+04	2.5493703E+03	1.0595635E+04
1.0160626E+05	-1.1027380E+04	1.0679947E+06	-1.1199628E+00	-7.8125594E+00	2.8602480E+00
-2.8950820E+04	-3.9853282E+05	-8.0973104E+04	2.5223731E+01	1.6773461E+00	4.8419719E+00
-5.8540882E+03	-7.1115741E+04	-2.1668442E+04	4.5093504E+00	3.5281451E-01	8.3781869E-01

CORRELATION

-.0238804	.0027502	-.0000971	.0037233	-.0006216	-.0001150
-.0452468	.0024664	-.0002142	-.0000525	-.0011135	-.0001817
-.0064189	.0020771	-.0000114	.0044656	-.0001984	-.0000486
.0445822	-.0024810	.0002106	-.0000832	.0010985	.0001797
.0164144	-.0022437	.0000525	-.0034545	.0004346	.0000836
.0050796	-.0002221	.0000249	.0001259	.0001249	.0000198

CARTESIAN FOR P PARAMETERS VEHICLES 3 AND 1

COVARIANCE

-1.8155415E+07	2.2403560E+07	-3.1441182E+07	9.4384103E+03	-8.7797011E+03	-3.6094135E+04
-3.1930248E+07	3.2469390E+07	2.5006973E+06	-5.8862105E+03	6.2647240E+02	1.4014430E+04
7.2395136E+06	-7.3263214E+06	-8.6192855E+05	1.4623386E+03	-2.2015746E+02	-3.7037926E+03
-1.2687544E+03	1.0752745E+03	1.8883336E+03	-9.3378403E-01	5.2499057E-01	2.9673554E+00
-1.8737562E+03	1.7466359E+03	1.4683316E+03	-8.5921878E-01	4.0581661E-01	2.5799959E+00
2.2010438E+02	-1.8054485E+02	-3.7750439E+02	1.8071642E-01	-1.0520995E-01	-5.7435009E-01

CORRELATION

-.0002137	-.0003371	.0000524	-.0001092	-.0001581	.0000160
.0002653	.0003448	-.0000533	.0000931	.0001482	-.0000132
-.0001930	.0000138	-.0000033	.0000846	.0000646	-.0000143
.0001817	-.0001017	.0000173	-.0001315	-.0001186	.0000214
-.0003506	.0000224	-.0000054	.0001533	.0001161	-.0000259
-.0001424	.0003496	-.0000090	.0000856	.0000729	-.0000140

ORBIT PLNE FOR P PARAMETERS VEHICLES 3 AND 1

COVARIANCE

-1.8796040E+06	-4.8154533E+07	7.1111316E+06	3.7491541E+03	-1.4087183E+03	9.8390697E+03
4.0708517E+06	2.7940878E+07	2.7021943E+07	1.3369839E+03	-6.6890432E+03	3.9255811E+04
2.7938005E+05	3.9912867E+06	-2.6314635E+06	-9.2257022E+02	5.5496434E+02	-3.6400340E+03
7.5987196E+01	-2.4121402E+03	2.1344342E+03	3.8671669E-01	-5.0272685E-01	3.0474027E+00
-1.2724545E+02	1.0238537E+03	-1.8987311E+03	-2.7790057E-01	4.5328522E-01	-2.7459871E+00
-2.8814194E+01	2.1453347E+02	-4.2035352E+02	-5.9881533E-02	1.0134343E-01	-5.9979105E-01

CORRELATION

-.0001077	.0002257	.0000103	.0000342	-.0000529	-.0000106
-.0003964	.0002226	.0000527	-.0001562	.0000611	.0000113
.0000415	.0001528	-.0000098	.0000981	-.0000805	-.0000158

.0001417	.0000409	-.0000223	.0001150	-.0000762	-.0000145
-.0000787	-.0003618	.0000199	-.0002210	.0001830	.0000364
.0000366	.0001413	-.0000091	.0000891	-.0000741	-.0000143

CARTESIAN FOR P AND Q PARAMETERS VEHICLES 3 AND 1

COVARIANCE

-9.5888520E+09	1.1192143E+10	-1.1247665E+10	-6.6512593E+05	-0.0355705E+05	2.1838300E+05
-1.1928532E+10	1.2872958E+10	-5.2511087E+09	-7.6930121E+05	-0.4270991E+05	2.5208294E+05
2.6795368E+09	-2.0882031E+09	1.1505800E+09	1.7271647E+05	1.8873897E+05	-5.6984037E+04
-3.2072065E+05	3.0054090E+05	2.3016841E+05	-1.0177074E+01	-1.5040705E+01	5.9550021E+00
-5.8692160E+05	5.9899544E+05	2.7939600E+04	-3.5947322E+01	-3.6327432E+01	1.1715756E+01
5.1360163E+04	-4.6009381E+04	-5.5700899E+04	2.7895226E+00	2.2222067E+00	-0.9428201E-01

CORRELATION

-.0059599	-.0056508	.0010244	-.0014502	-.0026147	.0001967
.0065958	.0068052	-.0010469	.0012956	.0025301	-.0001671
-.0040024	-.0015762	.0002518	.0006199	.0000713	-.0001223
-.0058657	-.0050065	.0009360	-.0011727	-.0022722	.0001516
-.0068980	-.0064893	.0009965	-.0009947	-.0022351	.0001175
.0008525	.0008824	-.0001356	.0001701	.0003278	-.0000215

ORBIT PLNE FOR P AND Q PARAMETERS VEHICLES 3 AND 1

COVARIANCE

-1.3652682E+09	-2.0015227E+10	-3.1479570E+09	1.2640391E+06	7.7789851E+04	2.4249670E+05
1.5311329E+09	1.4049993E+10	8.1955842E+09	-8.9739305E+05	-9.8561522E+04	-1.5405704E+05
2.5948243E+08	4.0713392E+09	4.4981908E+08	-2.5683337E+05	-1.4303279E+04	-5.0211404E+04
-2.5822972E+04	-8.6223096E+05	2.0917799E+05	5.3069577E+01	8.1263956E-01	1.1342264E+01
-1.2095153E+04	2.8987493E+05	-2.8701045E+05	-1.7699408E+01	1.3286231E+00	-4.4402149E+00
-3.2930006E+03	5.8256275E+04	-6.6786493E+04	-3.5504179E+00	3.3208109E-01	-8.9645641E-01

CORRELATION

-.0041959	.0045545	.0005109	-.0006241	-.0002696	-.0000650
-.0079991	.0054340	.0010423	-.0027101	.0008380	.0001494
-.0011039	.0027817	.0001011	.0005769	-.0007301	-.0001503
.0078802	-.0054148	-.0010257	.0026411	-.0003004	-.0001421
.0028818	-.0035377	-.0003417	.0002370	.0003574	.0000790
.0008951	-.0005504	-.0001187	.0003292	-.0001109	-.0000212

CARTESIAN FOR P PARAMETERS VEHICLES 3 AND 2

COVARIANCE

2.2099148E+13	-3.4395954E+12	-3.3545699E+12	-8.2197762E+08	1.7413755E+09	1.8014646E+08
1.6565361E+13	-2.8054893E+12	-9.9709359E+12	2.0249311E+09	7.2744922E+08	-4.3770901E+08
-3.7197699E+12	6.3182045E+11	2.2769325E+12	-4.7166368E+08	-1.5958532E+08	1.0321171E+08
1.4906768E+07	-1.9471392E+07	-5.5782561E+08	1.9200818E+05	-4.0939931E+04	-4.1525955E+04
4.7325437E+08	-9.3138514E+07	-7.0281540E+08	2.0080918E+05	-1.0478753E+04	-4.3489009E+04
1.8933087E+07	2.9428271E+05	1.0211158E+08	-3.6748088E+04	9.3734118E+03	7.9424510E+03

CORRELATION

.4917049	.3306273	-.0509045	.0024261	.0754704	.0025958
-.4954505	-.3628895	.0559755	-.0205160	-.0961557	.0002612
-.0550267	-.1457183	.0229720	-.0669327	-.0826287	.0103211
-.1457393	.3220593	-.0514352	.2490229	.2551838	-.0401481
.5581215	.2091451	-.0314587	-.0959812	-.0240713	.0185117
.0297320	-.0648027	.0104770	-.0501327	-.0514436	.0080773

ORBIT PLNE FOR P PARAMETERS VEHICLES 3 AND 2

COVARIANCE

-5.4445418E+12	-1.9471883E+13	8.5829534E+12	7.2253027E+08	-2.0234636E+09	-2.7125238E+08
5.1369829E+12	1.9600803E+13	3.6226599E+11	-1.7454422E+09	-9.0223646E+08	-1.0475984E+08
1.0755021E+12	3.8074465E+12	1.9408642E+12	-1.0774311E+08	4.9247107E+08	6.6711463E+07
-1.6579252E+08	-5.1997125E+08	-7.2071049E+08	-3.9331202E+04	-2.2307450E+05	-2.8941321E+04
1.8166733E+07	-5.1116869E+06	4.6981564E+08	5.7072649E+04	1.6355908E+05	2.0914424E+04
1.5489345E+06	-1.0483846E+07	1.0331038E+08	1.3286883E+04	3.6105381E+04	4.6071216E+03

CORRELATION

-.4463267	.4075830	.0564783	-.1068851	.0108025	.0000149
-.4263255	.4153590	.0534006	-.0895310	-.0008118	-.0014731
-.1350350	.0055164	.0195506	-.0891724	.0536160	.0104312
.2132185	-.4985293	-.0203675	-.0912781	.1221670	.0251636
-.3498633	-.1509871	.0545459	-.3033287	.2051326	.0400641
-.0429119	-.0150404	.0067506	-.0360067	.0239998	.0846775

CARTESIAN FOR P AND Q PARAMETERS VEHICLES 3 AND 2

COVARIANCE

2.2099656E+13	-3.4359649E+12	-3.3544447E+12	-8.2201590E+08	1.7413449E+09	1.8015669E+08
1.6565725E+13	-2.8044183E+12	-9.9708343E+12	2.0248845E+09	7.2745509E+08	-4.3769665E+08

-3.7199508E+12	6.3090745E+11	2.2768961E+12	-4.7165319E+08	-1.5958678E+08	1.0320893E+08
1.4904914E+07	-1.9331267E+07	-5.5782101E+08	1.9200696E+05	-4.0937866E+04	-4.1525639E+04
4.7326349E+08	-9.2952797E+07	-7.0280726E+08	2.0080692E+05	-1.0477024E+04	-4.3488413E+04
1.8933926E+07	2.8074875E+05	1.0211094E+08	-3.6747896E+04	9.3729922E+03	7.9424010E+03

CORRELATION

.4917030	.3306263	-.0509055	.0024258	.0754714	.0025959
-.4934355	-.3612718	.0557274	-.0203600	-.0956767	.0002484
-.0550233	-.1467125	.0229716	-.0669320	-.0826275	.0103210
-.1457424	.3220442	-.0514340	.2490209	.2551799	-.0401478
.5580916	.2031397	-.0314586	-.0959752	-.0240669	.0185107
.0297330	-.0647994	.0104768	-.0501323	-.0514427	.0080773

ORBIT PLNE FOR P AND Q PARAMETERS VEHICLES 3 AND 2

COVARIANCE

-5.4401219E+12	-1.9472752E+13	-8.5828540E+12	7.2253794E+08	-2.0234121E+09	-2.7124325E+08
5.1339354E+12	1.9601572E+13	3.6219315E+11	-1.7454148E+09	-9.0227242E+08	-1.0476644E+08
1.0745013E+12	3.8075181E+12	1.9408418E+12	-1.0774571E+08	4.9246061E+08	6.6709613E+07
-1.6559894E+08	-5.1999950E+08	-7.2070555E+08	-3.9328983E+04	-2.2307227E+05	-2.8940939E+04
1.8099837E+07	-5.1079851E+06	4.6981484E+08	5.7070717E+04	1.6355833E+05	2.0914303E+04
1.5353686E+06	-1.0483338E+07	1.0331001E+08	1.3286445E+04	3.6105230E+04	4.6070975E+03

CORRELATION

-.4454935	.4059175	.0563732	-.1066505	.0107517	.0008069
-.4263290	.4133667	.0534027	-.0895350	-.0008112	-.0014730
-.1350289	.0055152	.0195604	-.0891714	.0536157	.0104311
.2132117	-.4985082	-.0203677	-.0912716	.1221615	.0251625
-.3498430	-.1503905	.0545447	-.3033242	.2051314	.0400639
-.0429091	-.0150412	.0067504	-.0360061	.0239996	.0046775

* *

** A BINARY PLOT FILE HAS BEEN GENERATED ON TAPE12
WITH THE FOLLOWING COMMENTS AND RECORD FORMAT **

WORD		PARAMETER	MIN VALUE	MAX VALUE
1		TIME(MIN)	0.	3.00000E+01
** ATA INVERSE WITH P-PARAMETER EFFECTS **				
2	0001	X	1.65584E+04	1.00000E+07
3	0001	Y	1.61729E+04	1.00000E+07
4	0001	Z	5.91930E+04	1.00000E+07
5	0001	DX	8.52135E+00	1.00000E+03
6	0001	DY	4.04794E+00	1.00000E+03
7	0001	DZ	4.13995E+01	1.00000E+03
8	0002	X	7.11830E+06	1.00000E+07
9	0002	Y	2.04038E+06	1.00000E+07
10	0002	Z	9.92709E+06	1.00000E+07
11	0002	DX	3.33330E+02	1.00000E+03
12	0002	DY	5.46833E+02	1.00000E+03
13	0002	DZ	3.96046E+02	1.00000E+03
14	0003	X	5.49328E+06	1.00000E+07
15	0003	Y	7.14404E+06	1.00000E+07
16	0003	Z	9.87071E+06	1.00000E+07
17	0003	DX	8.69174E+02	1.00000E+03
18	0003	DY	8.71158E+02	1.00000E+03
19	0003	DZ	9.93201E+02	1.00000E+03
* C(X) P - PARAMETER EFFECTS *				
20	1	X	1.39208E+04	1.00000E+07
21	1	Y	1.38428E+04	1.00000E+07
22	1	Z	2.65343E+04	1.00000E+07
23	1	DX	3.50912E+00	1.00000E+03
24	1	DY	4.10355E+00	1.00000E+03
25	1	DZ	4.15413E+01	1.00000E+03
* C(CP) P - PARAMETER EFFECTS *				
26	1	P	2.74522E+03	1.00000E+07
27	1	T	1.91120E+04	1.00000E+07
28	1	C	2.69234E+04	1.00000E+07
29	1	DP	4.16220E+00	1.00000E+03
30	1	DT	2.81481E+00	1.00000E+03
31	1	DC	4.23045E+01	1.00000E+03

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```
* C(X)  P - PARAMETER EFFECTS *
32  2        X          7.36426E+06     1.00000E+07
33  2        Y          1.13754E+06     1.00000E+07
34  2        Z          9.97730E+06     1.00000E+07
35  2        DX         9.24148E+02     1.00000E+03
36  2        DY         5.11236E+02     1.00000E+03
37  2        DZ         9.92734E+02     1.00000E+03

* C(CP) P - PARAMETER EFFECTS *
38  2        R          1.91911E+06     1.00000E+07
39  2        T          7.18550E+06     1.00000E+07
40  2        C          9.99358E+06     1.00030E+07
41  2        DR         5.33116E+02     1.00000E+03
42  2        DT         9.09887E+02     1.00000E+03
43  2        DC         9.94457E+02     1.00800E+03

* C(X)  P - PARAMETER EFFECTS *
44  3        X          6.10238E+06     1.00000E+07
45  3        Y          6.80351E+06     1.00000E+07
46  3        Z          9.92272E+06     1.00000E+07
47  3        DX         8.34332E+02     1.00000E+03
48  3        DY         8.51509E+02     1.00185E+03
49  3        DZ         9.90441E+02     1.00000E+03

* C(DP) P - PARAMETER EFFECTS *
50  3        R          6.35637E+06     1.00000E+07
51  3        T          6.56739E+06     1.00000E+07
52  3        C          9.92272E+06     1.00000E+07
53  3        DR         8.08256E+02     1.00140E+03
54  3        DT         8.76239E+02     1.00000E+03
55  3        DC         9.90441E+02     1.00000E+03

** ATA INVERSE WITH P+Q PARAMETER EFFECTS **
56 0001      X          2.33153E+05     1.00000E+07
57 0001      Y          3.09323E+05     1.00000E+07
58 0001      Z          4.68032E+05     1.00000E+07
59 0001      DX         2.06295E+01     1.00000E+03
60 0001      DY         1.75015E+01     1.00000E+03
61 0001      DZ         4.16185E+01     1.00000E+03
62 0002      X          7.11591E+06     1.00000E+07
63 0002      Y          2.04235E+06     1.00000E+07
64 0002      Z          9.92709E+06     1.00000E+07
65 0002      DX         9.33390E+02     1.00000E+03
```

23
CONT'D

```
66 0002      DY        5.46841E+02     1.00000E+03
67 0002      DZ        9.96046E+02     1.00000E+03
68 0003      X         5.49344E+06     1.00000E+07
69 0003      Y         7.14417E+06     1.00000E+07
70 0003      Z         3.87071E+06     1.00000E+07
71 0003      DX        8.59175E+02     1.00000E+03
72 0003      DY        3.71160E+02     1.00000E+03
73 0003      DZ        9.93201E+02     1.00000E+03

* C(X)  P+C PARAMETER EFFECTS *
74   1       X         2.43490E+05     1.00000E+07
75   1       Y         2.78032E+05     1.00000E+07
76   1       Z         4.60450E+05     1.00000E+07
77   1       DX        1.85735E+01     1.00000E+03
78   1       DY        1.90871E+01     1.00000E+03
79   1       DZ        4.19750E+01     1.00000E+03

* C(OP) P+C PARAMETER EFFECTS *
80   1       P         5.11982E+04     1.00000E+07
81   1       T         3.93536E+05     1.00000E+07
82   1       C         4.48509E+05     1.00000E+07
83   1       DP        2.52350E+01     1.00000E+03
84   1       DT        4.24215E+00     1.00000E+03
85   1       DC        4.26218E+01     1.00000E+03

* C(X)  P+C PARAMETER EFFECTS *
86   2       X         7.36427E+06     1.00000E+07
87   2       Y         1.14035E+06     1.00000E+07
88   2       Z         9.97790E+06     1.00000E+07
89   2       DX        9.24148E+02     1.00000E+03
90   2       DY        5.11242E+02     1.00000E+03
91   2       DZ        9.92734E+02     1.00000E+03

* C(OP) P+C PARAMETER EFFECTS *
92   2       P         1.02107E+06     1.00000E+07
93   2       T         7.18554E+06     1.00000E+07
94   2       C         3.39358E+06     1.00030E+07
95   2       DP        5.33122E+02     1.00000E+03
96   2       DT        3.09848E+02     1.00000E+03
97   2       DC        3.94457E+02     1.00000E+03
```

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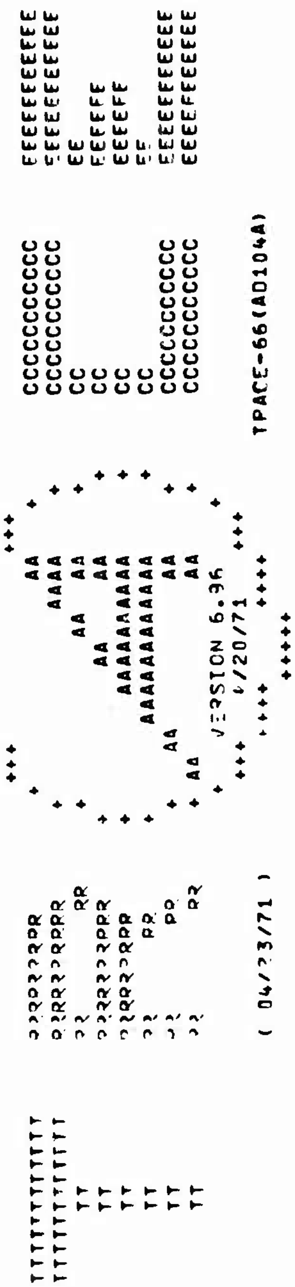
```
 * C(X)  P+C PARAMETER EFFECTS *
  98   3        X              6.10313E+06     1.00000E+07
  99   3        Y              6.80367E+06     1.00000E+07
 100   3        Z              9.92272E+06     1.00000E+07
 101   3        DX             8.34333E+02     1.00000E+03
 102   3        DY             8.51512E+02     1.00185E+03
 103   3        DZ             9.90441E+02     1.00000E+03

 * C(CP) P+C PARAMETER EFFECTS *
 104   3        P              6.35558E+06     1.00000E+07
 105   3        T              6.56750E+06     1.00000E+07
 106   3        C              9.92272E+06     1.00000E+07
 107   3        DP             9.08259E+02     1.00140E+03
 108   3        DT             8.76310E+02     1.00000E+03
 109   3        DC             9.90441E+02     1.00000E+03
```

23

ITEM	DESCRIPTION	REFERENCE SECTION
23	The record formats of TAPE12, containing the square roots of the diagonal elements of the matrices indicated. The minimum and maximum values on the tape for the computations are also printed	2.5.1 [ØPBØX(F)]

C.5 TEST CASE D: MCI SINGLE-VEHICLE EPHEMERIS GENERATION RUN (ITIN = 3)



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```
MODEL DATA                                                                                  CARD   1
DITIN 3                                                                                     CARD   2
INFORM1                                                                                     CARD   3
INTERM0                                                                                     CARD   4
IPLANT1                    2     0                  21    1                                 CARD   5
 22    .6944444444E-3      23    16.28810076        24    .6944444444E-3                    CARD   6
 PLANT                     17    1.                 18    .6944444444E-3                    CARD   7
 25    1.                  26    1.                 TAPE7-1                                 CARD   8
 PLANT                     16    1.00002516                                                 CARD   9
TICENM1                   ILNORM1                                                           CARD  10
 SGM   .6802328701E-4      AM    .27249217                                                  CARD  11
INTL   1                                                                                    CARD  12
H      LUNAR MODEL                                                                          CARD  13
MTERMS04,60                                                                                 CARD  14
D      02,00                     0.                       0.                                CARD  15
 H0    2                   HMIN 2                  HMAX 2                                   CARD  16
END
```
(1)

```
***************************************** LUNAR GRAVITY MODEL *****************************************

GM = 6.8023287010E-05 ER**3/MIN**2  = 1.7314000009E+14 FT**3/SEC**2  = 4.9027792902E+12 M**3/SEC**2
              NO NORMALIZATION WITH    1 TERMS.
          N    M       CNM              SNM          **    N    M        CNM              SNM
          2    0    0.               0.              **

***************************************** EARTH GRAVITY MODEL *****************************************

GM = 5.5303935000E-03 ER**3/MIN**2  = 1.4076538841E+16 FT**3/SEC**2  = 3.9860318297E+14 M**3/SEC**2
          ***SPHERICAL EARTH***

***************************************** PHYSICAL CONSTANTS *****************************************

GM(ER**3/MIN**2)    =  5.5303935000E-03   OMEGE(RAD/MIN)  =  4.375269100E-03  GMLAT(DEG)   =  7.830000000E+01
GMKM(KM**3/MIN**2)  =  0.                 OMEGA(RAD/MIN)  =  4.375269100E-03  GMLNG(DEG)   =  2.910000000E+02
SGM(ER**3/MIN**2)   =  6.802328701E-05    OMEGL(RAD/MIN)  =  0.               AM(ER)       =  2.724921700E-01
ERFT(FT/ER)         =  2.092573800E+07    ERKM(KM/ER)     =  6.378164900E+03  ERNM(NM/ER)  =  3.443933600E+03
FTKM(FT/KM)         =  3.280839900E+03    FTNM(FT/NM)     =  6.076115500E+03  AE(ER)       =  1.000000000E+00
GSUBO(FT/SEC**2)    =  3.217400000E+01    DGREE(DEG)      =  5.729577951E+01  SLT          =  2.820176300E+03
```

ITEM	DESCRIPTION	REFERENCE SECTION
1	Card images of the input MODEL data. Emphasis is on the variables associated with a run in the lunar integration mode:	
	PLANT	2.1.3
	ICENM LNØRM, NTL	2.1.2.2
	SGM, AM	2.1.1

```
CKEP             =  1.000000000E-07    F             =  3.352329869E-03  PI          =  3.141592654E+00

**************************************** INPUT/OUTPUT CONVERSION FACTORS *******************************

DF(I/O-ER) =  2.09257380E+07   VF(I/O-ER/MIN) =  3.48762300E+05   AF(I/O-ER/MIN**2) =  5.81270500E+03

**************************************** INTEGRATION INPUTS ********************************************

  IFORM =   1              ICENT =   1              NSTEP =   2
  NPCMP =   0              IR    =   8              ER    = 1.00000000E-10
  HMIN  = 2.00000000E+00   HMAX  = 2.00000000E+00   HO    = 2.00000000E+00

**************************************** SPECIAL OPTIONS ***********************************************

  TAPE2  =    0     TAPE7  =   -1     TELEM  =    0     PTAPE  =    0     NPDOT  =    0
  PRHO   =    0     NODPR  =    0     CLASS  =    0     LEMSP  =    0     PTNS   =10000

**************************************** CRASH ALTITUDE ************************************************

  ECI CRASH ALTITUDE(FT) =   3.000000000E+05         MCI CRASH ALTITUDE(FT) =   3.000000000E+03

ENTER SEGMENT 01 AT   121.7 SECONDS.  EXECUTION TIME FOR SEGMENT  0 WAS   121.7 CP SECS.,   430.1 PP SECS.

******************************************** VEHICLE DATA **********************************************

      IVEHID1                                                                        CARD   1
      IYEAR 1967              IMNTH 4                  IDAY  18                      CARD   2
       TZNE 0                  HR   0                   MIN  2.4688333333E3          CARD   3
       SEC  0                                                                        CARD   4
      IICTYP-11                IC   1.10617555345      2     -4.8269172572           CARD   5
       3    -3.3136952336      4    -1.885658509E-3    5     1.010441446E-2          CARD   6
       6    7.05817720489E-3                                                         CARD   7
       PHASE1                                                                        CARD   8
       PTIM 1                  2    2                  3     0                       CARD   9
       4    720.               5    2.8428333333E3                                   CARD  10
       6    30.                7    2876.                                            CARD  11
       6    30.                7    3876.                                            CARD  12
       6    30.                7    800.                                             CARD  13
      DPRCDEX                                                                        CARD  14
      DPRCDE  X      X                                                               CARD  15
      END                                                                            CARD  16
```

2

ITEM	DESCRIPTION	REFERENCE SECTION
2	Card images of the input VEHICLE data. The variables associated with a lunar integration run are emphasized:	
	ICTYP	11.1.4
	PHASE	11.1.6

***** HYPERBOLIC ORBIT. F AND G ELEMENT SET IS UNAVAILABLE AT PRESENT. *****

EPOCH	INITIAL CONDITIONS			
YR/MO/DAY	X,Y,Z,DX,DY,DZ	A,D,B,A,R,V	A,E,I,O,U,TAU	AF,AG,N,L,CHI,PSI
TZNE,HR,MIN,SEC	2.31475398135E+07	2.82907487377E+02	-1.07315621590E+07	0.
1967/ 4/18	-1.01005805572E+08	-3.37887309789E+01	1.09681141984E+00	0.
0.	-6.93415182702E+07	1.77947341526E+02	3.87507025093E+01	0.
0.	-6.57645633490E+02	6.97802462480E+01	3.39391443309E+02	0.
2.46883333330E+03	3.52403882722E+03	1.24685322263E+08	9.09284281807E+01	0.
0.	2.46162611579E+03	4.34867242779E+03	2.88904557605E+03	0.

THE FOLLOWING BODIES ARE USED FOR PLANETARY PERTURBATIONS
MOON

** NO ATMOSPHERE MODEL **

****

****

** PLANETARY TAPE CONSTANTS **

BODY	MASS(EM)	DIST. SCALE FACTOR(ER)	VEL. SCALE FACTOR(ER/MIN)
SUN	3.32951300E+05	2.34548550E+04	1.62881008E+01
MOON	1.22999000E-02	1.00002516E+00	6.94444444E-04
VENUS	8.14979000E-01	1.00000000E+00	1.00000000E+00
MARS	1.07821000E-01	6.94444444E-04	1.00000000E+00
JUPITER	3.17887000E+02	2.34548650E+04	0.
SATURN	9.51290000E+01	2.34548550E+04	0.

*** PLUS ***

NUTATION(RAD) = 1.000000000E+00 NUTATION RATE(RAD/MSDYS) = 6.944444444E-04

3

ITEM	DESCRIPTION	REFERENCE SECTION
3	<u>A table of planetary constants</u>, as preset or input, and of options requiring the planetary ephemeris tape. In this case, the options are moon perturbations and eclipsing	2.1.3 11.3.1.2

```
****************************************** ECLIPSING CONSTANTS ******************************************

RE =  1.00000000E+00      RS =  1.09121800E+02      RM =  2.72506300E-01      ERAU =  2.34548650E+04 4

***********************************************************************************************************
**** PLANETARY EPHEMERIS FILE INITIALIZED WITH    6 BODY(IES). 5

***********************************************************************************************************

ENTER SEGMENT 10 AT    122.3 SECONDS.  EXECUTION TIME FOR SEGMENT  1 WAS      .5 CP SECS.,      3.6 PP SECS.

          TRAJECTORY INTEGRATION FOR CASE   1

IVEP       0      ICENT       1      IDRAG       0      ALPHG    3.585328504E+00  CD4W 0.
JVEP       0      JNORM       1      IR          8      ALG-DEG  2.054241915E+02  ER   1.000000000E-10
MVEP       0      MAJOR       0      ISRP        0      TJDATE   2.439598500E+06  HMIN 2.000000000E+00
KVEP       0      NMASS       0      NEQS        3      TSTART   2.468833333E+03  HMAX 2.000000000E+00
LVEP       0      NT          0      RECMP       0      TSTOP    3.268833333E+03  HO   2.000000000E+00
ICENTX     1      JNORMX      1      NMASSX      0      FLIGHT   8.000000000E+02  NTX  0.
                                     NASA        0      SSTEP    1.000000000E+02  SORD 1.500000000E+00

                                         * PREDETERMINED EVENT TABLE *
 TIME(MME)     TYPE        ASSOCIATED QUANTITIES
   2468.8333 TZERO
   3268.8333 TSTOP

          *** TRAJECTORY START

          * * * * * * * * * * * * * * * * * * *     MCI  * * * * * * * * * * * * * * * * * * * * 6
SEG12 ENTRY TIME IS   122.45500

     PRECESSION MATRIX FROM MEE-EPOCH TO MEE-DATE
     9.9999999999333E-01      1.0494515030427E-06      4.5619121073485E-07
    -1.0494516030427E-06      9.9999999999944E-01     -2.3937529677164E-13   7
    -4.5619121073485E-07     -2.3937530062820E-13      9.9999999999989E-01

     SELENOGRAPHIC MATRIX FROM MEE-DATE TO MF-DATE
     8.5791576365784E-01      5.1353198153613E-01     -1.6292525578576E-02
    -4.8065053901101E-01      7.9097178531435E-01     -3.7860096960385E-01   8
    -1.8153677808800E-01      3.3263875116427E-01      9.2541658696247E-01
```

ITEM	DESCRIPTION	REFERENCE SECTION
4	The constants for the determination of eclipsing, requested by PRCDE(H), are the radii of the earth, sun, and moon (in er) and the number of er/au (au = astronomical unit)	11.3.1
5	Indicates the planetary ephemeris file TAPE7 has been initialized (i. e., read) to the date of epoch, with two bodies (sun and moon)	16
6	Output comment specifying the coordinate system in which the numerical integration will be performed	11.1.6
7	Precession matrix used to rotate from MEE of midnight day of epoch to MEE of current date, printed whenever LEMSP = 0	2.1.4
8	Selenographic matrix from MEE to MF, printed when LEMSP = 0	2.1.4

```
 MCI  VECTORS  AT  T  =     2468.833333       H  =          .250000       NSTEP  =           0

                      2.314753981350E+07      -6.576466334896E+02      -3.433679901877E-04
                     -1.010058059718E+08       3.524038827223E+03       8.731074964758E-03
                     -6.934131827016E+07       2.461626115785E+03       6.079749704093E-03

 ECI  VECTORS
                     -9.393036259099E+08      -2.605945998745E+03       7.263048026485E-03
                      5.322930504899E+08       9.355392952157E+02       3.726008404297E-03
                      3.230934691360E+08       1.226209106591E+03       2.978264333485E-03


  FORCES        MAGNITUDE     X       Y      Z     ( EXTERNAL UNITS )       RADIAL        IN-TRACK      CROSS-TRACK
SELENOPOTENTI 1.113696E-02-2.067551E-03 9.021985E-03 6.193624E-03-1.113696E-02 3.469447E-17 1.387779E-16
OTHER BODIES  1.752257E-03 1.724183E-03-2.909101E-04-1.138740E-04 6.190841E-04 1.611891E-03-2.982365E-04
TOTAL         1.054485E-02-3.433680E-04 8.731075E-03 6.079750E-03-1.051788E-02 1.611891E-03-2.982365E-04


*             STEP   DOUBLED       T  =  2475.333333     H  =       .500000     NSTEP  =       25
*             STEP   DOUBLED       T  =  2483.833333     H  =      1.000000     NSTEP  =       41
*             STEP   DOUBLED       T  =  2500.833333     H  =      2.000000     NSTEP  =       57

   ***  CRASH  ***          ALTITUDE  =   -76344.0     TIME   =    2880.83333 10

SEG12 EXIT TIME IS  125.26430 TOTAL TIME IN SEG12 WAS    2.80800 SECONDS TO PROCESS      247 STEPS

 MCI  VECTORS  AT  T  =     2880.833333       H  =         2.000000       NSTEP  =        247

                      3.791576050137E+06      -2.685598080283E+03      -3.687047484945E+00
                     -3.744130620623E+06       7.046579359872E+03       3.640811386103E+00
                     -1.803319931610E+06       4.555337144496E+03       1.754145097956E+00


 ECI  VECTORS
                     -1.004436843417E+09      -4.440455848847E+03      -3.678980319840E+00
```

ITEM	DESCRIPTION	REFERENCE SECTION
9	The vectors $\underline{r}$, $\dot{\underline{r}}$, and $\ddot{\underline{r}}$ in the integration coordinate frame and in the ECI frame at epoch	Case A: Item 30
10	Indicates when and where the vehicle crashed into the moon	2.1.3 2.1.4

```
                    5.640676741008E+08            4.338720210350E+03            3.636268229247E+00
                    3.591575464330E+08            3.245180355422E+03            1.751256984947E+00

  FORCES       MAGNITUDE     X      Y      Z     ( EXTERNAL UNITS )        RADIAL        IN-TRACK      CROSS-TRACK
SELENOPOTENTI 5.470625E+00-3.587125E+00 3.640842E+00 1.754169E+00-5.470625E+00 7.203194E-09 4.973799E-14
OTHER BODIES  8.737533E-05 7.797226E-05-3.102316E-05-2.433802E-05 8.100298E-05 2.806469E-05-1.689197E-05
TOTAL         5.470544E+00-3.547047E+00 3.640811E+00 1.754145E+00-5.470544E+00 2.807190E-05-1.689197E-05

     ***  VEHICLE CRASHED (1)

     ***  THIS CASE TOOK       2.876  SECONDS TO INTEGRATE A SPAN OF    412.0000  MINUTES  ***

         ***  FROM        2468.833   TO        2880.833  MINUTES FROM MIDNIGHT OF EPOCH  ***

ENTER SEGMENT 50 AT    125.3 SECONDS.  EXECUTION TIME FOR SEGMENT 10 WAS     3.0 CP SECS.,     49.1 PP SECS.
```

ITEM	DESCRIPTION	REFERENCE SECTION
11	Remark giving reason for termination (in this case, because the vehicle crashed)	

*** TRACE66 EPHEMERIS OUTPUT KEY ***

DATE,...	MF,MM,ST,DT	X,Y,Z,R	DX,DY,DZ,V	LAT,...	ALPHA,...	REV,...	REMARKS
MO/DAY/YR	MIN FROM EPOCH	X (FT)	DX (FT/SEC)	LATITUDE (DEG)	ALPHA (DEG)	REV COUNT	.
HR/MIN	MIN FROM MIDNIGHT	Y (FT)	DY (FT/SEC)	LONGITUDE(DEG)	DELTA (DEG)	PERIOD	.
SEC	SEC FROM MIDNIGHT	Z (FT)	DZ (FT/SEC)	ALTITUDE (NM)	BETA (DEG)	PER-DECAY	.
	STEP SIZE(MIN)	R (FT)	V (FT/SEC)	S-VEH-LAT(DEG)	AZIMUTH(DEG)	NOD-REG	.
	DIST TO MOON(ER)	LAT-MOON(DEG)	LON-MOON(DEG)	LAT-EARTH(DEG)	LON-EARTH(DEG) 12		.

```
* * * * * * * * * * * * * * * * * * * * * * * *
*                                             *
*        SPECIAL OUTPUT OPTIONS REQUESTED     *
*                                             *
* C  APOGEE-PERIGEE                           *   13
* J  MOON - FIX                               *
*                                             *
* * * * * * * * * * * * * * * * * * * * * * * *
```

*** MCI TRAJECTORY ***

ITEM	DESCRIPTION	REFERENCE SECTION
12	Key to additional ephemeris output provided in lunar runs	
13	Special output options requested by PRCDE	11.3.1.2

```
*** CASE    1
***


*** EPOCH PRINT

DATE,...    ME,MM,ST,DT        X,Y,Z,R         DX,DY,DZ,V          LAT,...        ALPHA,...      REV,...   MCI
4/19/67         0.00000    2.31475398E+07  -6.57546633E+02  -33.78873098   282.90748738     .77972
17/ 8        2468.83333   -1.01006806E+08   3.52403883E+03  -77.09251221   -33.78873098    0.00000
50.00000    61730.00000   -6.93415183E+07   2.46162612E+03   19582.12025   177.94734153    0.00000
                 .25000    1.24685322E+08   4.34967243E+03  -33.78873098    69.78024625    0.00000

            CLASSICAL ELEMENTS    ( A,E,I,O,U,TAU )
 -1.07315622E+07   1.09681142E+00   3.87507025E+01   3.39391443E+02   9.09284232E+01   2.60926066E+03

DATE,...    ME,MM,ST,DT        X,Y,Z,R         DX,DY,DZ,V          LAT,...        ALPHA,...      REV,...   MF
4/19/67         0.00000    8.09956508E+07  -2.94728354E+03  -12.17957226   311.64849893     .86253
17/ 8        2468.83333   -9.10722076E+07   3.05296783E+03  -48.35150066   -12.17957226    0.00000
50.00000    61730.00000   -2.63056484E+07   9.54549037E+02   19582.12025   177.65893199    0.00000
                 .25000    1.24685322E+08   4.34951224E+03  -12.17957226   282.52768331    0.00000
               58.16398    1.89276533E+01   4.23325212E+01   -6.56148470    -6.51581120

            CLASSICAL ELEMENTS    ( A,E,I,O,U,TAU )
 -1.07267055E+07   1.12438170E+00   1.62595798E+02   2.68132925E+02   1.05503772E+02   2.61038237E+03

*** REQUESTED PRINTS

DATE,...    ME,MM,ST,DT        X,Y,Z,R         DX,DY,DZ,V          LAT,...        ALPHA,...      REV,...   MCI
4/19/67         0.00000    2.31475398E+07  -6.57546633E+02  -33.78873098   282.90748738     .77972
17/ 8        2468.83333   -1.01006806E+08   3.52403883E+03  -77.09251221   -33.78873098    0.00000
50.00000    61730.00000   -6.93415183E+07   2.46162612E+03   19582.12025   177.94734153    0.00000
                 .25000    1.24685322E+08   4.34857243E+03  -33.78873098    69.78024625    0.00000

DATE,...    ME,MM,ST,DT        X,Y,Z,R         DX,DY,DZ,V          LAT,...        ALPHA,...      REV,...   MF
4/19/67         0.00000    8.09956508E+07  -2.94728354E+03  -12.17957226   311.64849893     .86253
17/ 8        2468.83333   -9.10722076E+07   3.05296783E+03  -48.35150066   -12.17957226    0.00000
50.00000    61730.00000   -2.63056484E+07   9.54549037E+02   19582.12025   177.65893199    0.00000
                 .25000    1.24685322E+08   4.34951224E+03  -12.17957226   282.52768331    0.00000
               58.16398    1.89276533E+01   4.23325212E+01   -6.56148314    -6.52038602
```

14

ITEM	DESCRIPTION	REFERENCE SECTION
14	Epoch print in lunar mode in MCI and MF (moon-fixed) coordinate frames (Item 38 of Case A plus one line at the end of the MF output, as in Item 12 of this case). The classical elements in MCI and MF coordinate frames are also shown	

```
DATE,...    ME,MM,ST,DT       X,Y,Z,R            DX,DY,DZ,V          LAT,...        ALPHA,...      REV,...   MF
 4/20/67      411.83356   5.32324080E+06   -6.08367879E+03   -3.31007435   333.16785725    .94144   *CRASH*
  0/ 0       2880.66689  -2.02552741E+06    6.09263787E+03  -20.83214234    -3.31007435   0.00000
40.01336       40.01336  -3.29409986E+05    1.58840219E+03      .49376    154.94370509   0.00000
                2.00000   5.70509989E+06    8.75525015E+03   -3.31007435    72.21872601   0.00000
               67.87118  -1.61428184E+01    1.24793857E+02    5.78130875   175.80364851

          CLASSICAL ELEMENTS   ( A,E,I,O,U,TAU )
 -1.08498492E+07   1.11275053E+00   1.80769519E+01   3.49374042E+02   1.88718229E+02   2.60561349E+03

DATE,...    ME,MM,ST,DT       X,Y,Z,R            DX,DY,DZ,V          LAT,...        ALPHA,...      REV,...   MC1
 4/20/67      412.00000   3.79157606E+06   -2.68559808E+03  -18.70238820   315.36187188    .86771   PRE-EVNT
  0/ 0       2880.83333  -3.74408062E+06    7.04657936E+03  -44.63812771   -18.70238820   0.00000
50.00000       50.00000  -1.80390993E+06    4.55533714E+03    -12.56592   154.62950533   0.00000
                2.00000   5.62574778E+06    8.81009729E+03  -18.70238820    55.93435572   0.00000

          CLASSICAL ELEMENTS   ( A,E,I,O,U,TAU )
 -1.07774001E+07   1.11430955E+00   3.83112676E+01   3.40732834E+02   8.76630660E+01   2.60846103E+03

DATE,...    ME,MM,ST,DT       X,Y,Z,R            DX,DY,DZ,V          LAT,...        ALPHA,...      REV,...   MF
 4/20/67      412.00000   5.26223684E+06   -6.13368611E+03   -3.19484061   339.52754951    .94247   PRE-EVNT
  0/ 0       2880.83333  -1.96458627E+06    6.11193076E+03  -20.47235007    -3.19484061   0.00000
50.00000       50.00000  -3.13531907E+05    1.59145781E+03    -12.56592   154.71321546   0.00000
                2.00000   5.62574778E+06    8.80400709E+03   -3.19484061    72.20012514   0.00000
               57.92550   1.74346113E+01    3.03008926E+02   -6.41658430    -6.21646446

          CLASSICAL ELEMENTS   ( A,E,I,O,U,TAU )
 -1.08498490E+07   1.11277339E+00   1.80751758E+01   3.49375107E+02   1.88710806E+02   2.60561375E+03

          ***  VEHICLE CRASHED

          ***  END OF TRAJECTORY  ***
```

C.6 TEST CASE E: ECI SINGLE-VEHICLE POWERED FLIGHT EPHEMERIS GENERATION RUN (ITIN = 3)

(02/21/74)

VERSION 7.27
10/31/73

TRACE-66(AD10AA)

```
MODEL DATA
H1    TRPX MODEL                                                                          CARD  1
INFORM1                 INTERM3                    MTERMS04,69                            CARD  2
D      J2,0                  -1.08827E-3               0.                                 CARD  3
D      J3,0                  2.693E-6                  0.                                 CARD  4
D      J4,0                  1.4E-6                    0.                                 CARD  5
 CRASH0.                 HMIN 0.00390625          H0   0.015625                           CARD  6
 LEMSPJ                  GM   0.55309362E-2       IFTNS 100                               CARD  7
 ER   1.E-11            INPCMP1                   DITIN 3                                 CARD  8
END                                                                                       CARD  9

****************************************** EARTH  GRAVITY MODEL **************************************

 GM =  .55309362000E-02 ER**3/MIN**2  =  .14077920183E+17 FT**3/SEC**2  =  .39864229815E+15 M**3/SEC**2
             NO NORMALIZATION WITH   3 TERMS.
         N    M          CNM              SNM           **    N    M         CNM             SNM
         2          -.108827 0E-02    0.                **    4    0     .14000000E-05    0.
         3           .26930 0E-05     0.                **
 
**************************************** GENERAL PERTURBATIONS GRAVITY MODEL ****************************

 GM =  .55304177445E-02 ER**3/MIN**2  =  .14076601655E+17 FT**3/SEC**2  =  .39860493040E+15 M**3/SEC**2

                  **** ZONAL HARMONICS ****

 EJ2 =  .108254900JE-02      EJ3 =-.24350000000E-05      EJ4 = -.12320000000E-05

****************************************** PHYSICAL CONSTANTS ******************************************

 GM(ER**3/MIN**2)     =   .55309362 E-02    OMEGE(RAD/MIN)  =   .43752691 E-02   GMLAT(DEG)     =   .78300000000E+02
 GMKM(KM**3/SEC**2)   =  0.                 OMEGA(RAD/MIN)  =   .43752691 E-02   GMLNG(DEG)     =   .29100000000E+03
 SGM(ER**3/MIN**2)    =   .69 23265 E-04    OMEGL(RAD/MIN)  =  0.                AM(ER)         =   .272536277E+00
 ERFT(FT/ER)          =   .20925738 E+08    ERKM(KM/ER)     =   .637816430E+04   ERNM(NM/ER)    =   .344393360E+04
 FTKM(FT/KM)          =   .328083990E+04    FTNM(FT/NM)     =   .607611550E+04   AE(ER)         =   .100000000E+01
 GSUBJ(FT/SEC**2)     =   .321740 E+02      DGREE(DEG)      =   .572957795E+02   SLT(ER/MIN)    =   .282017630E+04
 CKEP                 =   .1 10    E-11     F               =   .335232987E-02   PI             =   .314159265E+01
```

ITEM	DESCRIPTION	REFERENCE SECTION
1	Card images of the input MODEL data. Emphasis is given to the variables associated with a powered flight run (ITIN = 3), the others having been discussed earlier:	
	NPCMP, PTNS, ER, CRASH	2.1.4

```
****************************************** INPUT/OUTPUT CONVERSION FACTORS ******************************************

 OF(I/O-ER) =    .20925738E+08   VF(I/O-ER/MIN) =    .34876230E+06   AF(I/O-ER/MIN**2) =    .58127959E+04

****************************************** INTEGRATION INPUTS ******************************************

                             IDENT  =    1              NSTEP =   2
  NPCMP =   1                IR     =    8              ER    =  .10000000E-10
  HMIN  =  .39062500E-02     HMAX   =   .64000000E+02   HC    =  .15625000E-01

****************************************** SPECIAL OPTIONS ******************************************

  TAPE2  =    0      TAPE7  =    0      TELEM  =    0      PTAPE  =    0      NFDOT  =    0
  PRHO   =    0      NODPR  =    0      CLASS  =    0      LEMSF  =    0      PTNS   =  100

****************************************** CRASH ALTITUDE TABLE ******************************************
                                                  (IN FT)

  ECI CRASH ALTITUDE =   0.                                  MCI CRASH ALTITUDE =    .33000000E+04

****************************************** INTERPLANETARY CRASH ALTITUDES TABLE ******************************************
                                                  (IN FT)

  BODY(1) CRASH ALTITUDE =     .30000000E+06         BODY(2) CRASH ALTITUDE =    0.
  BODY(3) CRASH ALTITUDE =     .30000000E+04         BODY(4) CRASH ALTITUDE =    0.
  BODY(5) CRASH ALTITUDE =    0.                     BODY(6) CRASH ALTITUDE =    0.
  BODY(7) CRASH ALTITUDE =    0.

ENTER SEGMENT 01 AT     12.6 SECONDS. EXECUTION TIME FOR SEGMENT  0 WAS     12.6 CP SECS.
```

2

ITEM	DESCRIPTION	REFERENCE SECTION
2	Crash altitude table. ECI and MCI crash altitudes at which to stop integrating for the sun and moon, respectively	2.1.3 2.1.4
	Interplanetary crash altitude table. Crash altitudes at which to stop integrating for solar system bodies	2.1.3

```
*************************************** VEHICLE DATA FOR CASE  1 ***************************************
IVEHID3002                                                                        CARD   1
IYR   1971         IMNTH 1                    IDAY  1                             CARD   2
 HR   0             MIN  0                     SEC  0                             CARD   3
IICTYP4             AL    99.9932723962302     CL   0.                            CARD   4
 IC   0.           2     0.                   3     90.                           CARD   5
 4    90.          5     2.0925738E7          6     1525.92892397                 CARD   6
IIDRAG3            IKDRAG-1                                                       CARD   7
 DRAG 80.                0.                         0.                            CARD   8
      80.                0.                         0.                            CARD   9
      80.                0.                         0.                            CARD  10
      80.                0.                         0.                            CARD  11
      80.                0.                         0.                            CARD  12
      80.                0.                         0.                            CARD  13
      80.                0.                         0.                            CARD  14
      50.                0.                         0.                            CARD  15
DPRCODE  X   X      ALTFR1                  2      65.8313210075                  CARD  16
 PTIM 0            2     1                  3      0                              CARD  17
 4    10.          5     60.                                                      CARD  18
 DALPH0.0125680950 IIOTPFF                  POWER1.                               CARD  19
INPFRP3                                                                           CARD  20
MFFRP 16,15              1.                        291.656666667                  CARD  21
      6000.              400000.                   2400.0                         CARD  22
      0                  0                         0                              CARD  23
      0                  .1666666666666      01,022.                              CARD  24
      291.666666666      6000.                     376000.                        CARD  25
      2400.              0                         0                              CARD  26
      -5.                0                         -.1833333333333                CARD  27
 01,032.                 291.666666666             6000.                          CARD  28
      -373600.           2400.                     0                              CARD  29
      0                  0                         0                              CARD  30
      -.277513333      01,042.                     291.666666666                  CARD  31
      6000.              -360038.197683            2400.                          CARD  32
      1                  0                         .0                             CARD  33
      0                  -1.83333333         01,051.                              CARD  34
      54                 6000.                     -136000.                       CARD  35
      3757               0                         0                              CARD  36
      0                  0                         -1.84333333                    CARD  37
 01,061.                 0.                        6000.                          CARD  38
      -133764.           0                         0                              CARD  39
      0                  0                         0                              CARD  40
      -1.86666666      01,071.                     300.                           CARD  41
      6000.              115485.                   750.0                          CARD  42
      0                  0                         0                              CARD  43
      0.                 -4.11666666         01,081.                              CARD  44
      0.                 6000.                     10000.                         CARD  45
      0.                 0.                        0.                             CARD  46
      0.                 0.                        -60.                           CARD  47
 CDAS 0            2     0                  3      .22                            CARD  48
 4    .3           5     .21                6      .6                             CARD  49
 7    .17          8     1.15               9      .55                            CARD  50
 10   2.5          11    .45                12     12.0                           CARD  51
 13   .38          14    0.                 15     0.                             CARD  52
END                                                                               CARD  53
```

(3)

ITEM	DESCRIPTION	REFERENCE SECTION
3	Card images of input VEHICLE data. Emphasis is given to the variables associated with a powered flight run (ITIN = 3), the others having been discussed earlier:	
	AL, DL, IØTPF, NPFRP, PFRP, DALPH, KDRAG	11.1.5
	ALTPR	11.3.1.2
	CDAS	11.1.8

```
    EPOCH                                     INITIAL CONDITIONS
  YR/MC/DAY          X,Y,Z,DX,DY,DZ        A,D,B,A,R,V            A,E,I,O,U,TAU          AF,AG,N,L,CHI,PSI
TZNE,HR,MIN,SEC      -.36312964377E+07     .39993272396E+02     .10491016770E+08      .17293193251E+00
 1971/ 1/ 1           .2?6??255545E+03    0.                    .99653832592E+00     -.98141957265E+00
 0.                  0.                    .90100000000E+02     .50536739438E-12      .2??3499238E+00
 0.                  -.15027777375E+04     .90100000000E+02     .27999327240E+03      .99993272396E+02
 0.                  -.2?4??3??31E+03      .20325738000E+08     .36000000000E+03     -.47433638210E-14
 0.                  -.13459535204E-10     .15259289240E+04    -.14973863691E+02      .76532639055E-15

NO PLANETARY PERTURBATIONS.

 ** NO ATMOSPHERE MODEL **

**********************************************************************************************************


ENTER SEGMENT 02 AT     12.8 SECONDS.  EXECUTION TIME FOR SEGMENT  1 WAS      .2 CP SECS.

ENTER SEGMENT 1? AT     12.8 SECONDS.  EXECUTION TIME FOR SEGMENT  2 WAS      .0 CP SECS.

 ********************************* TRAJECTORY INTEGRATION FOR CASE   1  ****************************************

IVEP        0      ICENT      1      IDRAG      3      ALPHG     .174521183E+01   CDAW   .800000000E+02
JVEP        0      JNORM      1      IR         9      ALG-DEG   .999932724E+02   ER     .100000000E-10
MVEP        0      MAJOR      0      ISRF       0      TJDATE    .244095259E+07   HMIN   .195312500E-02
KVEP        0      NMASS      0      NEQS       3      TSTART   0.                HMAX   .640000000E+02
LVEP        0      NT         3      RECMP      2      TSTOP     .600000000E+02   HJ     .125000000E+00
ICENTX      1      JNORMX     0      NMASSX     0      FLIGHT    .600000000E+02   NTX   0.
                                     NASA       0      SSTEP     .100000000E+03   SORC   .150000000E+01
                                     NRING      0      CPAW     0.                UTD    .350000000E+02
                                     IFORM      0
```

(4)

ITEM	DESCRIPTION	REFERENCE SECTION
4	Quantities associated with the current vehicle (Table C-1)	

Table C-1. Definitions of Initialized Integration Quantities

Symbol	Definition	Reference Section
IVEP	Number of C and S parameters (GPRAM)	2.1.5.2
JVEP	Number of other model parameters (ØPRAM)	2.1.5.3
MVEP	Number of mass parameters (MPRAM)	2.1.5.1
KVEP	Number of vehicle-dependent parameters (VPRAM)	11.1.14
LVEP	Number of delayed parameters (i.e., THRUST, DRAG, etc.)	11.1.14
ICENTX	Central force flag for the moon	
ICENT	Central force flag for the earth	
JNORM	Normalization for the earth gravity model	2.1.2.2
MAJOR	Flag for the integration of the variational equations	
NMASS	Number of masses in the earth gravity model	
NT	Number of terms in the earth gravity model	2.1.2.2
JNORMX	Normalization for the lunar gravity model	2.1.2.2
IDRAG	Flag indicating the atmospheric model used	11.1.8
IR	Ratio of Runge-Kutta to Cowell step size (H0/IR)	2.1.4
ISRP	Flag for solar radiation pressure	2.1.2.6
NEQS	Total number of equations to be integrated	
RECMP	Flag for recomputation of perturbations	2.1.4
NMASSX	Number of masses in the lunar gravity model	
NASA	Coordinate and timekeeping transformation option flag	2.1.4

Table C-1. Definitions of Initialized Integration Quantities (Continued)

Symbol	Definition	Reference Section
ALPHG	Right ascension of Greenwich (rad at midnight of epoch day)	
ALG-DEG	Right ascension of Greenwich (deg at midnight of epoch day)	
TJDATE	Julian date of epoch day	
TSTART	Trajectory start time (MME)	
TSTOP	Trajectory stop time (MME)	
FLIGHT	Duration of flight (TSTOP-TSTART, min)	
SSTEP	Number of integration steps specified per rev when the regularized time variable is used	11.1.6
CDAW	Reciprocal of the ballistic coefficient	
ER	Error control in integration (ER = $1.^{-S}$, where S is the number of significant figures)	2.1.4
HMIN	Minimum absolute step size for integration	2.1.4
HMAX	Maximum absolute step size for integration	2.1.4
H0	Initial integration step size: A negative value indicates backward integration	2.1.4
NTX	Number of terms in the lunar gravity model	2.1.2.2
SORD	Power of the regularization transformation	11.1.6
CPAW	Solar radiation pressure coefficient	11.1.4
UTD	Correction that relates iteration time to ephemeris time, sec	2.1.4

```
                                  * PREDETERMINED EVENT TABLE *
TIME(MME)    TYPE       ASSOCIATED QUANTITIES
    0.0000 TZERO
                        AL                OL
                          .59993272E+02     0.

STAGE        T,ST,SDT      TF,WF,DV,HF,AA   ISP,AE,WO,WD,DRAG   RATES,WR,WP,WY,LIFTZ,LIFTAL
                           AZ                   BETA
NO. 1          0.000000     .16666667E+00      .29166667E+03    CONSTANT
               0.000000    0.                  .60000000E+04       0.
              10.000000    0.                  .40000000E+06       0.
PRIMARY                    0.                  .24000000E+04       0.
                           0.                  .80000000E+02       0.
                           0.                 0.                   0.

STAGE        T,ST,SDT      TF,WF,DV,HF,AA   ISP,AE,WO,WD,DRAG   RATES,WR,WP,WY,LIFTZ,LIFTAL
                           AZ                   BETA
NO. 2           .166667     .18333333E+00      .29166667E+03    CONSTANT
              10.000000    0.                  .60000000E+04       1.
               1.000000    0.                  .37600000E+06       -.50000000E+01
SECONDARY                  0.                  .24000000E+04       0.
                           0.                  .80000000E+02       0.
                           0.                 0.                   1.

STAGE        T,ST,SDT      TF,WF,DV,HF,AA   ISP,AE,WO,WD,DRAG   RATES,WR,WP,WY,LIFTZ,LIFTAL
                           AZ                   BETA
NO. 3           .183333     .27751333E+00      .29166667E+03    CONSTANT
              11.100000    0.                  .60000000E+04       1.
               5.650800    0.                  .37360000E+06       1.
SECONDARY                  0.                  .24000000E+04       0.
                           0.                  .80000000E+02       0.
                           0.                 0.                   1.

STAGE        T,ST,SDT      TF,WF,DV,HF,AA   ISP,AE,WO,WD,DRAG   RATES,WR,WP,WY,LIFTZ,LIFTAL
                           AZ                   BETA
NO. 4           .277513     .18333333E+01      .29166667E+03    GRAVITY TURN
              16.650800    0.                  .60000000E+04       1.
              93.349200    0.                  .36003808E+06       0.
SECONDARY                  0.                  .24000000E+04       1.
                           0.                  .80000000E+02       0.
                           0.                 0.                   1.
```

5 CONT'D

ITEM	DESCRIPTION	REFERENCE SECTION
5	Quantities associated with the predetermined event table (Table C-2)	

Table C-2. Definitions of Predetermined Event Table Quantities

Symbol	Definition	Reference Section
TZERØ	Time to start integration	
AL	Right ascension of launch α_L, deg	11.1.15
DL	Declination of launch δ_L, deg	11.1.15
STAGE	Stage number	11.1.15
T	Start time of this stage, minutes from epoch	11.1.15
ST	Start time t, sec	11.1.15
SDT	Δt, sec, where the start time of the next stage is $t + \Delta t$, min	11.1.15
TF	Termination time for this stage, minutes from epoch	
WF	Final weight, lb	11.1.15
DV	Achieved change in velocity during this stage, ft/sec	11.1.15
HF	Cutoff altitude for this stage, ft	11.1.15
AA	Cutoff angle of attack for this stage, deg	11.1.15
AZ	Roll axis azimuth at the start of this stage	11.1.15
ISP	Specific impulse, sec	11.1.15
AE	Exit area, ft^2	11.1.15
W0	Initial vehicle weight for this stage, lb	11.1.15
WD	Weight flow rate, lb/sec	11.1.15
DRAG	Drag reference area, C_DA or A	11.1.15
BETA	Roll axis pitch attitude at the start of this stage	11.1.15

Table C-2. Definitions of Predetermined Event Table Quantities (Continued)

Symbol	Definition	Reference Section
RATES	= CONSTANT; WR, WP, WY are constant throughout this stage	11.1.15
	= GRAVITY TURN; this is a gravity turn stage (Item 11)	
	= FREE FLIGHT: this is a free flight stage (Item 12)	
WR	Roll axis turning rate, deg/sec	
WP	Pitch axis turning rate, deg/sec	11.1.15
WY	Yaw axis turning rate, deg/sec	
LIFTZ	Constant lift reference area coefficient $C_{L_0}A$ or A	
LIFTAL	Lift slope reference area coefficient $C_{L_\alpha}A$ or A	
TSTØP	Time to stop integration (Item 5)	
PRIMARY[a]	Certain primary parameters (ISP, AE, W0, WD, DRAG, LIFTZ, and LIFTAL) are defined for a primary stage and are held constant until the next primary stage is reached	11.1.15
SECONDARY[b]	Secondary parameters (WR, WP, WY, TF, DV, HF, WF, AA, AZ, and BETA) can change at each secondary stage (for secondary stages occurring within a primary stage), while the primary parameters remain constant	11.1.15

[a]Primary parameters define the vehicle configuration.

[b]Secondary parameters control maneuvering of the vehicle specified by the primary parameters.

```
STAGE        T,ST,SDT        TF,WF,DV,HF,AA    ISP,AE,WO,WD,DRAG    RATES,WR,WP,WY,LIFTZ,LIFTAL
                             AZ                     BETA
NO. 5           1.833333      .18433333E+01        .54000000E+02    CONSTANT
              110.000000     0.                    .60000000E+04        0.
                 .600000     0.                    .13600000E+06        0.
PRIMARY                      0.                    .37570000E+04        0.
                             0.                    .80000000E+02        0.
                             0.                0.                       0.

STAGE        T,ST,SDT        TF,WF,DV,HF,AA    ISP,AE,WO,WD,DRAG    RATES,WR,WP,WY,LIFTZ,LIFTAL
                             AZ                     BETA
NO. 6           1.843333      .18666667E+01    0.                   FREE FLIGHT
              110.500000     0.                0.                       0.
                1.400000     0.                    .13374580E+06        0.
PRIMARY                      0.                0.                       0.
                             0.                    .80000000E+02        0.
                             0.                0.                       0.

STAGE        T,ST,SDT        TF,WF,DV,HF,AA    ISP,AE,WO,WD,DRAG    RATES,WR,WP,WY,LIFTZ,LIFTAL
                             AZ                     BETA
NO. 7           1.866667      .41166667E+01        .30000000E+03    CONSTANT
              112.000000     0.                    .60000000E+04        0.
              135.000000     0.                    .11548500E+06        0.
PRIMARY                      0.                    .75000000E+03        0.
                             0.                    .80000000E+02        0.
                              .                0.                       0.

STAGE        T,ST,SDT        TF,WF,DV,HF,AA    ISP,AE,WO,WD,DRAG    RATES,WR,WP,WY,LIFTZ,LIFTAL
                             AZ                     BETA
NO. 8           4.116667      .50000000E+02    0.                   FREE FLIGHT
              247.000000     0.                0.                       0.
             3353.000000     0.                    .10000000E+05        0.
PRIMARY                       .                0.                       0.
                              .                    .50000000E+02        0.
                             0.                0.                       0.

      60.0000 TSTOP
```

5

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```
***  TRAJECTORY START  8
***  POWERED FLIGHT

* * * * * * * * * * * * * * * * * * * *  ECI  * * * * * * * * * * * * * * * * * * * *
SEG18 ENTRY TIME IS   12.89900

 TSEC =          .000000    T  =        0.000000    H  =           .015625    NSTEP  =          0

                      X,Y,Z                          XD,YD,ZD                       XDD,YDD,ZDD

               -.363129649770E+07            -.150277773754E+04            -.295181229789E+01
                .206982555446E+08            -.264798324310E+03             .167521047208E+02
               0.                            -.134595352040E-10            -.129863715188E-03

  FORCES       MAGNITUDE     X       Y      Z      ( EXTERNAL UNITS )       RADIAL        IN-TRACK      CROSS-TRACK
 GEOPOTENTIAL  3.220200E+01 5.588094E+00-3.171343E+01-1.298687E-04-3.220200E+01 1.143514E-18-1.298687E-04
 ATMOSPHERIC   1.529623E-16 1.506416E-16 2.654412E-17 2.159191E-22 1.838109E-22-1.529623E-16 2.159191E-22
 THRUST        4.921208E+01-8.539897E+00 4.846544E+01 0.            4.921208E+01-3.979039E-13-3.231174E-27
 TOTAL         1.701008E+01-2.951802E+00 1.675200E+01-1.298687E-04 1.701008E+01-3.979029E-13-1.298687E-04
```

7

ITEM	DESCRIPTION	REFERENCE SECTION
6	Powered flight. This notation indicates that the vehicle is thrusting, i.e., that ISP and WD are nonzero. If ISP and WD are zero, the vehicle's trajectory is controlled by external forces only, i.e., the pull of the earth or the moon. In this case, the vehicle is considered to be in free flight.	
7	Trajectory print at the beginning of this stage: TSEC = time from epoch, sec T = time from epoch, min H = integration step size NSTEP = number of integration steps X, Y, Z = vehicle position at time t, ft XD, YD, ZD = vehicle velocity at time t, ft/sec XDD, YDD, ZDD = vehicle acceleration at time t, ft/sec^2	

```
STAGE              T,ST,STAU    H,RHO,MACH,P,VA     LAT,LONG,R,V,AA    ISP,W,CDAW,CLAW        XI,WR,WP,WY
NO. 1              0.000000     -.74343156E-07      0.                  .25492674E+03     -.17353254E+00
CONSTANT           0.000000      .23768946E-02      .36000000E+03       .40000000E+05      .98482814E+00
                   0.000000      .35465123E-08      .20925738E+08       .44000000E-04     0.
                                 .14695972E+02      .15259289E+04      0.                 0.
                                 .95351590E-05      .90000069E+02                         0.
                                                                                          0.
```

8

```
TSEC =      1.000000     T  =      .166667     H  =      .015625     NSTEP  =      11

               X,Y,Z                        XD,YD,ZD                      XDD,YDD,ZDD

     -.364649054873E+07          -.153495603531E+04          -.350647446474E+01
      .206764966957E+08          -.815050274055E+02           .200344323840E+02
     -.648979943981E-02          -.129721395149E-02          -.129419077535E-03
```

9

```
  FORCES       MAGNITUDE     X       Y       Z     ( EXTERNAL UNITS )      RADIAL        IN-TRACK      CROSS-TRACK
GEOPOTENTIAL  3.219920E+01 5.610729E+00-3.171659E+01-1.298305E-04-3.219920E+01 1.104126E-10-1.298405E-04
ATMOSPHERIC   5.952140E-02 1.027157E-02-5.862842E-02 4.124370E-07-5.952132E-02 1.016091E-04 4.125050E-07
THRUST        5.259766E+01-9.127405E+00 5.179965E+01 0.            5.259764E+01-3.835217E-02-1.629693E-08
TOTAL         2.033896E+01-3.536404E+00 2.003443E+01-1.294181E-04 2.033893E+01-3.825056E-02-1.294443E-04
```

```
STAGE              T,ST,STAU    H,RHO,MACH,P,VA     LAT,LONG,R,V,AA    ISP,W,CDAW,CLAW        XI,WR,WP,WY
NO. 1               .166667      .90832625E+03     -.17888378E-07       .25611673E+03     -.17353254E+00
CONSTANT          10.000000      .23143607E-02      .36000000E+03       .37600000E+05      .98482814E+00
                  10.000000      .16820852E+00      .20926646E+08       .45615542E-04     0.
                                 .14219973E+02      .15371184E+04      0.                 0.
                                 .18720916E+03      .56033344E-01                         0.
                                                                                          0.
```

10

ITEM	DESCRIPTION	REFERENCE SECTION
8	Quantities associated with the powered flight output at the beginning of this stage (Table C-3)	
9	Trajectory print at the end of this stage	Item 7
10	Powered flight output at the end of this stage	Item 8

Table C-3. Definitions of Powered Flight Output Quantities

Symbol	Definition	Reference Section
T	Time from epoch, min	
ST	Time from epoch, sec	
STAU	Time from the beginning of this stage, sec	
H	Vehicle altitude, ft	
RHØ	Atmospheric density at altitude h, slug/ft^3	
MACH	Mach number (the ratio of the speed of the body to the speed of sound in the surrounding atmosphere)	11.1.15
P	Pressure at altitude h, lb/in^2	
VA	Absolute value of the relative velocity vector	
LAT	Vehicle geodetic latitude, deg	
LØNG	Vehicle geodetic longitude, deg	
R	Vehicle geocentric radius, ft	11.1.14
V	Vehicle velocity, ft/sec	11.1.14
AA	Angle of attack, deg	11.1.15
ISP	$(ISP_i \cdot \dot{W} - Ae\ P(h))/\dot{W}$, where ISP_i (in sec), $\dot{W}$, and Ae are input quantities for the i^{th} stage and P(h) is computed.	11.1.15
W	Current vehicle weight, lb	
CDAW	$C_D A/W$	
CLAW	$(C_{L_0} + C_{L_\alpha} \cdot \alpha)A/W$, where α is the angle of attack	11.1.15
XI	Roll axis = $\underline{\xi} = \begin{Bmatrix} \xi_1 \\ \xi_2 \\ \xi_3 \end{Bmatrix}$	11.1.15
WR	Roll axis turning rate, deg/sec	11.1.15
WP	Pitch axis turning rate, deg/sec	11.1.15
WY	Yaw axis turning rate, deg/sec	11.1.15

```
***  POWERED FLIGHT

* * * * * * * * * * * * * * * * * * * *  ECI  * * * * * * * * * * * * * * * * * * * *
SEG18 ENTRY TIME IS   12.96800

 TSEC =        13.000000     T  =          .166667     H  =           .001953    NSTEP  =           11

                         X,Y,Z                           XD,YD,ZD                          XDD,YDD,ZDD

                 -.364648054873E+07              -.153495603531E+04              -.350641446474E+01
                  .206034966957E+08              -.815050274055E+02               .200344323840E+02
                 -.648979943981E-02              -.129721395149E-02              -.129418077535E-03


  FORCES       MAGNITUDE     X      Y      Z     ( EXTERNAL UNITS )       RADIAL        IN-TRACK      CROSS-TRACK
 GEOPOTENTIAL  3.219920E+01 5.610729E+00-3.173659E+01-1.298305E-04-3.219920E+01 1.104126E-10-1.298405E-04
 ATMOSPHERIC   5.952149E-02 1.027157E-02-5.862842E-02 4.124370E-07-5.952132E-02 1.016091E-04 4.125050E-07
 THRUST        5.259766E+01-9.127435E+00 5.179965E+01 0.            5.259764E+01-3.835217E-02-1.629603E-08
 TOTAL         2.033896E+01-3.506404E+00 2.003443E+01-1.294181E-04 2.033893E+01-3.825056E-02-1.294443E-04


 STAGE                  T,ST,STAU     H,RHO,MACH,P,VA    LAT,LONG,R,V,AA    ISP,W,CDAW,CLAW          XI,WR,WP,WY
 NO. 2                    .166667       .90832625E+03     -.17888378E-07     .25611673E+03       -.17353254E+00
 CONSTANT               10.000000       .23143607E-02      .36000000E+03     .37600000E+06        .98482814E+00
                         0.000000       .16823852E+00      .20926646E+08     .45615542E-04       0.
                                        .14219973E+02      .15371184E+04    0.                   0.
                                        .18720916E+03      .56033344E-01                         -.50000000E+01
                                                                                                 0.

  NODE  T =     .173215222799E+00      -.364683744089E+07      .206064797969E+08      .620239748153E-03
       DT =     .195312500000E-02      -.153570390157E+04     -.772317138037E+02      .102815687043E+00
```

```
TSEC =       11.000000     T  =          .183333     H   =           .001953    NSTEP  =          20

                        X,Y,Z                              XD,YD,ZD                          XDD,YDD,ZDD

                -.364801726553E+07             -.153848227290E+04             -.353462557153E+01
                 .206064252531E+08             -.613513300054E+02              .202080019221E+02
                 .759617574177E+00              .230317250271E+01              .461727981082E+01
  FORCES        MAGNITUDE      X       Y       Z       ( EXTERNAL UNITS )       RADIAL        IN-TRACK      CROSS-TRACK
GEOPOTENTIAL  3.219859E+01 5.612935E+00-3.170558E+01-1.310070E-04-3.219859E+01-1.961110E-07-1.298381E-04
ATMOSPHERIC   7.316037E-02 1.261795E-02-7.205949E-02-8.109075E-04-7.315575E-02 1.356065E-04-8.111105E-04
THRUST        5.298815E+01-9.160178E+00 5.198565E+01 4.618222E+00 5.278650E+01-3.536627E-02 4.618278E+00
TOTAL         2.102799E+01-3.534626E+00 2.020800E+01 4.617280E+00 2.051475E+01-3.523086E-02 4.617338E+00


STAGE                T,ST,STAU     H,RHO,MACH,P,VA     LAT,LONG,R,W,AA     ISP,W,CDAW,CLAW         XI,WR,WP,WY
NO. 2                  .183333      .110580660E+04      .20937778E-05       .25637126E+03      -.17287220E+00
CONSTANT             11.000000      .230093441E-02      .36000000E+03       .37360000E+05       .98108057E+00
                      1.000000      .186830945E+00      .20926844E+08       .45775654E-04       .87155743E-01
                                    .141181625E+02      .15397068E+04      0.                  0.
                                    .207793307E+03      .43653501E+01                          -.50000000E+01
                                                                                                0.

       ***  POWERED FLIGHT

       * * * * * * * * * * * * * * * * * * * *     ECI  * * * * * * * * * * * * * * * * * * * *
SEG18 ENTRY TIME IS     13.03790

TSEC =       11.000000     T  =          .183333     H   =           .000244    NSTEP  =          20

                        X,Y,Z                              XD,YD,ZD                          XDD,YDD,ZDD

                -.364801726553E+07             -.153848227290E+04             -.353462557153E+01
                 .206064252531E+08             -.613513300054E+02              .202080019221E+02
                 .759617574177E+00              .230317250271E+01              .461727981082E+01


  FORCES        MAGNITUDE      X       Y       Z       ( EXTERNAL UNITS )       RADIAL        IN-TRACK      CROSS-TRACK
GEOPOTENTIAL  3.219859E+01 5.612935E+00-3.170558E+01-1.310070E-04-3.219859E+01-1.961110E-07-1.298381E-04
ATMOSPHERIC   7.316037E-02 1.261795E-02-7.205949E-02-8.109075E-04-7.315575E-02 1.356065E-04-8.111105E-04
THRUST        5.298815E+01-9.160178E+00 5.198565E+01 4.618222E+00 5.278650E+01-3.536627E-02 4.618278E+00
TOTAL         2.102799E+01-3.534626E+00 2.020800E+01 4.617280E+00 2.051475E+01-3.523086E-02 4.617338E+00
```

```
STAGE              T,SW,STAU   H,RHO,MACH,P,VA   LAT,LONG,R,V,AA   ISP,W,CDAW,CLAW       XI,WR,WP,WY

NO. 3                .183333   .11058060E+04     .20937778E-05     .25637126E+03      -.17287220E+00
CONSTANT           11.000000   .23009341E-02     .36000000E+03     .37360000E+05       .98198057E+00
                    0.000000   .18683094E+00     .20926844E+08     .45775654E-04       .87155743E-01
                               .14113162E+02     .15397068E+04     0.                 0.
                               .20779307E+03     .43653501E+01                        0.
                                                                                      0.

*          STEP    DOUBLED        T   =     .189681     H   =     .001488     NSTEP   =      45
*          STEP    DOUBLED        T   =     .197982     H   =     .000977     NSTEP   =      61
*          STEP    DOUBLED        T   =     .214583     H   =     .001953     NSTEP   =      77
*          STEP    DOUBLED        T   =     .247786     H   =     .003906     NSTEP   =      93

 TSEC =        16.653800     T   =          .277513     H   =           .003906    NSTEP   =         101

                     X,Y,Z                         XD,YD,ZD                        XDD,YDD,ZDD

            -.365676933541E+07             -.155951933440E+04              -.391946831400E+01
             .206064128510E+08              .590891818731E+02               .224672720221E+02
             .885024034732E+02              .289348449908E+02               .481164709747E+01


  FORCES      MAGNITUDE      X       Y       Z    ( EXTERNAL UNITS )     RADIAL        IN-TRACK      CROSS-TRACK
GEOPOTENTIAL 3.219392E+01 5.625178E+00-3.169867E+01-2.663727E-04-3.219392E+01-2.470050E-06-1.302068E-04
ATMOSPHERIC  1.819448E-01 3.117549E-02-1.785510E-01-1.586009E-02-1.812516E-01 2.010433E-04-1.586599E-02
THRUST       5.539249E+01-9.575821E+00 5.434449E+01 4.827774E+00 5.518169E+01 2.458690E-02 4.827942E+00
TOTAL        2.330864E+01-3.919468E+00 2.246727E+01 4.811647E+00 2.280651E+01 2.478527E-02 4.811946E+00


STAGE              T,SW,STAU   H,RHO,MACH,P,VA   LAT,LONG,R,V,AA   ISP,W,CDAW,CLAW       XI,WR,WP,WY
NO. 3                .277513   .26210510E+04     .24392663E-03     .25827539E+03      -.17287220E+00
CONSTANT           16.650800   .21998930E-02     .35999999E+03     .35003808E+06       .98198057E+00
                    5.650800   .30002963E+00     .20928359E+08     .46660853E-04       .87155743E-01
                               .13356512E-02     .15609066E+04     0.                 0.
                               .33193661E+03     .88776889E-01                        0.
                                                                                      0.
```

```
 ***  POWERED FLIGHT
 * * * * * * * * * * * * * * * * * * * *   ECI  * * * * * * * * * * * * * * * * * * * *
SEG18 ENTRY TIME IS    13.17100

TSEC =        16.653800      T  =          .277513     H   =           .009488    NSTEP   =          101

                         X,Y,Z                             XD,YD,ZD                            XDD,YDD,ZDD

                -.765676933541E+07             -.155951933440E+04              -.391945641149E+01
                 .206654128512E+08              .590891818731E+02               .224672044732E+02
                 .885924034732E+02              .289348449908E+02               .481243101494E+01

  FORCES       MAGNITUDE     X        Y        Z      ( EXTERNAL UNITS )        RADIAL        IN-TRACK       CROSS-TRACK
GEOPOTENTIAL  3.219392E+01 5.625178E+00-3.169867E+01-2.663727E-04-3.219392E+01-2.470050E-06-1.302068E-04
ATMOSPHERIC   1.819448E-01 3.117549E-02-1.785510E-01-1.586009E-02-1.812516E-01 2.010433E-04-1.586599E-02
THRUST        5.539249E+01-9.575809E+00 5.434443E+01 4.828557E+00 5.518162E+01 2.460175E-02 4.828726E+00
TOTAL         2.330873E+01-3.919456E+00 2.246720E+01 4.812431E+00 2.289644E+01 2.480032E-02 4.812730E+00

STAGE                  T,ST,STAL     H,RHO,MACH,P,VA     LAT,LONG,R,V,AA     ISP,W,CDAW,CLAW        XI,WR,WP,WY
NO. 4                   .277513       .26210510E+04       .24392663E-03       .25827539E+03      -.17287198E+00
GRAVITY TURN   11     16.653800       .21398930E-02       .35999999E+03       .36003808E+06       .98107935E+00
                        0.000000      .30002963E+00       .20928359E+08       .46660853E-04       .87169895E-01
                                      .13356512E+02       .15609466E+04      0.                  0.
                                      .33193661E+03       .88773158E-01                          -.48254883E+00
                                                                                                  0.

*              STEP    DOUBLED          T   =        .290209      H   =       .000977     NSTEP   =        126
*              STEP    DOUBLED          T   =        .306810      H   =       .001953     NSTEP   =        142
*              STEP    DOUBLED          T   =        .340013      H   =       .003906     NSTEP   =        158
*              STEP    DOUBLED          T   =        .406420      H   =       .007813     NSTEP   =        174
```

ITEM	DESCRIPTION	REFERENCE SECTION
11	Gravity turn. This notation indicates that the pitch plane is fixed, i.e., that the pitch axis is fixed throughout the stage (the vehicle's body orientation is defined by the roll, pitch, and yaw axes)	

```
TSEC =       37.041425    T  -        .617357    H  =         .007913    NSTEP  =         291

                         X,Y,Z                          XD,YD,ZD                         XDD,YDD,ZDD

                -.268948050576E+07             -.165353137363E+04             -.523071513431E+01
                 .206128559857E+08              .599829537238E+03              .301543083636E+02
                 .251071623358E+04              .254268688923E+03              .180934763362E+02


 FORCES        MAGNITUDE     X      Y      Z     ( EXTERNAL UNITS )       RADIAL        IN-TRACK       CROSS-TRACK
GEOPOTENTIAL  3.215672E+01 5.665668E+00-3.165367E+01-3.997464E-03-3.215672E+01-2.337933E-05-1.400003E-04
ATMOSPHERIC   1.865508E+00 3.557639E-01-1.766205E+00-5.168669E-01-1.792509E+00-7.503355E-02-5.112762E-01
THRUST        6.718376E+01-1.141215E+01 6.357418E+01 1.861434E+01 6.455557E+01 2.892963E+00 1.838115E+01
TOTAL         3.555301E+01-5.230715E+00 3.015431E+01 1.809348E+01 3.367635E+01 2.817906E+00 1.786973E+01


STAGE                T,ST,STAU    H,RHO,MACH,P,VA    LAT,LONG,R,V,AA    ISP,W,CDAW,CLAW        XI,WR,WP,WY
NO. 4                  .617357    .14703844E+05      .69159383E-02      .27067544E+03       -.16673889E+00
GRAVITY TURN         37.041425    .15106449E-02      .35999984E+03      .31110058E+06        .94627297E+00
                     20.39 625    .86695869E+00      .20940442E+08      .91145875E-04        .27706606E+00
                                  .83964901E+01      .17772490E+04     0.                   0.
                                  .91772245E+03      .16490276E+00                          -.55408289E+00
                                                                                            0.
```

```
TSEC =        83.916425     T  =         1.398607     H  =          .007813     NSTEP  =          301

                          X,Y,Z                          XD,YD,ZD                        XDD,YDD,ZDD

                   -.377394742125E+07              -.198734950895E+04              -.982785276440E+01
                    .206811551825E+08               .252901478822E+04               .568600526852E+02
                    .493111556695E+05               .212483079985E+04               .668531214065E+02


 FORCES         MAGNITUDE      X        Y       Z      ( EXTERNAL UNITS )        RADIAL        IN-TRACK      CROSS-TRACK
GEOPOTENTIAL  3.190506E+01  5.727514E+00-3.138666E+01-7.520497E-02-3.190506E+01-3.093464E-04-2.128450E-04
ATMOSPHERIC   1.379395E+00  1.861784E-01-1.389365E+00-8.254415E-01-1.107023E+00-6.641848E-01-4.858907E-01
THRUST        1.132224E+02-1.574155E+01  8.933608E+01  6.775377E+01  9.986935E+01  5.473739E+01  3.950199E+01
TOTAL         8.831190E+01-9.627853E+00  5.686035E+01  6.685312E+01  5.785727E+01  5.411290E+01  3.901589E+01


STAGE                 T,ST,STAL     H,RHO,MACH,P,VA    LAT,LONG,R,V,AA    ISP,W,CDAW,CLAW         XI,WR,WP,WY


NO. 4                 1.398607     .96995094E+05     .13529935E+00     .29120340E+03      -.13903212E+00
GRAVITY TURN         83.916425     .38200033E-04     .35999780E+03     .19860058E+06       .78903208E+00
                     67.265625     .35906091E+01     .21022733E+08     .17803128E-03       .59841328E+00
                                   .18530648E+00     .38549163E+04    0.                 0.
                                   .35503050E+04     .23619894E+00                       -.30692977E+00
                                                                                         0.

           STEP    DOUBLED        T  =      1.429857     H  =       .015625     NSTEP  =       304
```

```
TSEC =      117.000000     T  =        1.833333    H  =          .015625    NSTEP  =        339

                    X,Y,Z                              XD,YD,ZD                          XDD,YDD,ZDD

             -.382962956769E+07                -.230522033241E+04               -.152285310936E+02
              .297693535782E+08                 .436610387306E+04                .878655526931E+02
              .1320 1167426E+06                 .441316756336E+04                .112924426454E+03


  FORCES         MAGNITUDE     X      Y      Z      ( EXTERNAL UNITS )       RADIAL         IN-TRACK      CROSS-TRACK
 GEOPOTENTIAL  3.161173E+01 5.732095E+00-3.108796E+01-1.983311E-01-3.161173E+01-7.155289E-04-2.408080E-04
 ATMOSPHERIC   1.096775E-01 1.343257E-02-7.891688E-02-7.497224E-02-8.051137E-02-7.022966E-02-2.479635E-02
 THRUST        1.655963E+02-2.097406E+01 1.190315E+02 1.131977E+02 1.215666E+02 1.062614E+02 3.677242E+01
 TOTAL         1.438895E+02-1.522853E+01 8.786555E+01 1.129244E+02 8.987438E+01 1.061905E+02 3.674738E+01


STAGE                 T,SI,STAU    H,RHO,MACH,P,VA    LAT,LONG,R,V,AA    ISP,W,CDAW,CLAW       XI,WR,WP,WY
NO. 4                  1.833333     .19414958E+06      .36051912E+00      .29165760E+03    -.12665776E+00
GRAVITY TURN         110.000000     .65685542E-06      .35999448E+03      .13600000E+06     .71880538E+00
                      93.349200     .61184691E+01      .21119885E+08      .24902211E-07     .68357636E+00
                                    .36276746E-02      .66221561E+04     0.                0.
                                    .64560562E+04      .24337381E+00                       -.19060108E+00
                                                                                           0.
```

```
***  POWERED FLIGHT

     * * * * * * * * * * * * * * * * * * * *   ECI  * * * * * * * * * * * * * * * * * * * *
SEG18 ENTRY TIME IS    13.5^200

 TSEC =      11 .300010     T  =        1.833333    H  =        .001953    NSTEP  =        339

                        X,Y,Z                        XD,YD,ZD                      XDD,YDD,ZDD

              -.382962956769E+07             -.230522033241E+04            -.33283^65^638E+00
               .207693535782E+08              .436610387306E+04             .332979488901E+01
               .132001167426E+06              .441316756336E+04             .325318098148E+02


  FORCES        MAGNITUDE    X      Y     Z     ( EXTERNAL UNITS )        RADIAL        IN-TRACK      CROSS-TRACK
 GEOPOTENTIAL  3.161173E+01 5.732.95E+00-3.108706E+01-1.983311E-01-3.161173E+01-7.155289E-04-2.408080E-04
 ATMOSPHERIC   1.096775E-01 1.343257E-02-7.891688E-02-7.497224E-02-8.051137E-02-7.022966E-02-2.479635E-02
 THRUST        4.799042E+01-6.078358E+00 3.449577E+01 3.280511E+01 3.523045E+01 3.079494E+01 1.065678E+01
 TOTAL         3.270347E+01-3.328337E-01 3.329795E+00 3.253181E+01 3.538208E+00 3.072403E+01 1.063174E+01


 STAGE                 T,ST,STAU    H,RHO,MACH,P,VA    LAT,LONG,R,V,AA    ISP,W,CDAW,CLAW        XI,WR,WP,WY
 NO. 5                  1.833333     .19414958E+06      .36051912E+00      .53994207E+02     -.12665776E+00
 CONSTANT             110.000000     .65685542E-06      .35999448E+03      .13600000E+06      .71880538E+00
                        0.000000     .61184691E+01      .21119885E+08      .24902211E-03      .68357636E+00
                                     .36276746E-02      .66221561E+04     0.                 0.
                                     .64560562E+04      .24337381E+00                        0.
                                                                                             0.
```

```
TSEC =      110.600000    T  =      1.843333    H  =        .001953    NSTEP  =        336

                 X,Y,Z                        XD,YD,ZD                     XDD,YDD,ZDD

          -.3831 1276599E+07           -.230545103455E+04           -.43673 857491E+00
           .20371973 8754E+08           .436827993374E+04            .392689255161E+01
           .1346549 56746E+06           .443285237602E+04            .330872257944E+02


 FORCES        MAGNITUDE     X       Y      Z     ( EXTERNAL UNITS )       RADIAL        IN-TRACK      CROSS-TRACK
GEOPOTENTIAL  3.160329E+01 5.731847E+00-3.107841E+01-2.022339E-01-3.160329E+01-7.273982E-04-2.436814E-04
ATMOSPHERIC   1.003649CE-01 1.229866E-02-7.228698E-02-6.894616E-02-7.375664E-0 -6.460791E-02-2.271563E-02
THRUST        4.879982E+01-6.180076E+00 3.507758E+01 3.335841E+01 3.582877E+01 3.132469E+01 1.979313E+01
TOTAL         3.332230E+01-4.367309E-01 3.926883E+00 3.308723E+01 4.151811E+00 3.125926E+01 1.077017E+01


STAGE              T,ST,STAL    H,RHO,MACH,P,VA   LAT,LCNG,R,V,AA   ISP,W,CDAW,CLAW        XI,WR,WP,WY
NO. 5              1.843333     .19619408E+06     .36771767E+00     .53994827E+02     -.12665776E+00
CONSTANT         110.600000     .59038429E-06     .35999437E+03     .13374580E+06      .71880538E+00
                    .600000     .61531680E+01     .21122729E+08     .25306629E-03      .6835 636E+00
                                .32390085E-02     .66368030E+04    0.                 0.
                                .64711681E+04     .27092423E+00                       0.
                                                                                      0.
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***  FREE FLIGHT (12)

     * * * * * * * * * * * * * * * * * * * *   ECI  * * * * * * * * * * * * * * * * * * * *
SEG18 ENTRY TIME IS    13.56630

 TSEC =       11.600000    T  =         1.843333    H  =          .009244    NSTEP  =          336

                      X,Y,Z                          XD,YD,ZD                         XDD,YDD,ZDL

              -.3831 1276599E+07           -.230545103455E+04            .574414546184E+01
               .2077197387 54E+08           .436827993374E+04           -.311506933932E+02
               .1346349567 46E+06           .443285237602E+04           -.271180030631E+00


 FORCES        MAGNITUDE      X        Y       Z      ( EXTERNAL UNITS )      RADIAL        IN-TRACK       CROSS-TRACK
GEOPOTENTIAL  3.160320E+01 5.731847E+00-3.107841E+01-2.022339E-01-3.159320E+01-7.273982E-04-2.436814E-04
ATMOSPHERIC   1.006490E-01 1.229866E-02-7.223688E-02-6.894616E-02-7.375664E-02-6.46 731E-02-2.271563E-02
TOTAL         3.167703E+01 5.744145E+00-3.115069E+01-2.711800E-01-3.167695E+01-6.533531E-02-2.295931E-02


STAGE                T,ST,STAU    H,RHO,MACH,P,VA    LAT,LONG,R,V,AA    ISP,W,CDAW,CLAW         XI,WR,WP,WY
NO. 6                 1.843333     .19699408E+06      .36771767E+00     0.                     -.12665776E+00
FREE FLIGHT         110.610000     .59038429E-06      .35999437E+03      .13374580E+06           .71880539E+00
                      0.00 000     .61531684E+01      .21122729E+08      .25306629E-03           .68357636E+00
                                   .32390035E-02      .66368030E+04     0.                      0.
                                   .64711631E+04      .27092423E+00                             0.
                                                                                                0.

*              STEP    DOUBLED          T  =       1.849681     H  =        .009488     NSTEP  =        361
*              STEP    DOUBLED          T  =       1.857982     H  =        .001977     NSTEP  =        377
```

ITEM	DESCRIPTION	REFERENCE SECTION
12	<u>Free flight.</u> This notation indicates that the vehicle is not thrusting; its acceleration is caused by external bodies only. When the vehicle is thrusting, i.e., when ISP and WD are nonzero, it is considered to be in powered flight	

```
TSEC =      112.000000    T  =        1.866667    H  =          .000977    NSTEP  =          386

                    X,Y,Z                              XD,YD,ZD                          XDD,YDD,ZDD

              -.383423476890E+07               -.229741172949E+04              .574073159275E+01
               .207789589512E+08                .432469532185E+04             -.311139471337E+02
               .140860685853E+06                .443247766411E+04             -.264903787812E+00


 FORCES       MAGNITUDE     X     Y     Z     ( EXTERNAL UNITS )        RADIAL        IN-TRACK      CROSS-TRACK
GEOPOTENTIAL  3.158340E+01 5.731280E+00-3.105832E+01-2.113492E-01-3.158340E+01-7.543195E-04-2.527058E-0-
ATMOSPHERIC   7.779577E-02 9.451416E-03-5.563053E-02-5.355461E-02-5.677779E-02-5.015867C-02-1.765153E-02
TOTAL         3.164323E+01 5.740732E+00-3.111395E+01-2.649038E-01-3.164018E+01-5.092292E-02-1.790423E-02


STAGE               T,ST,STAL     H,RHO,MACH,P,VA      LAT,LONG,R,V,AA     ISP,W,CDAW,CLAW          XI,WR,WP,WY
NO. 6               1.866667       .20360331E+06        .38454428E+00      0.                    -.12665776E+00
FREE FLIGHT       112.000000       .46115832E-06        .35999412E+03       .13374580E+05         .71880538E+00
                    1.400000       .61815487E+01        .21129338E+08       .25294121E-03         .68357636E+00
                                   .24818540E-02        .66051456E+04      0.                    0.
                                   .64388106E+04        .45772102E+00                            0.
                                                                                                 0.
```

```
***  POWERED FLIGHT

     * * * * * * * * * * * * * * * * * * * * *   ECI   * * * * * * * * * * * * * * * * * * * * *
SEG18 ENTRY TIME IS    13.79800

 TSEC =        112.000000      T  =          1.866667     H  =            .000122     NSTEP  =           386
                                  X,Y,Z                                 XO,YO,ZO                           XOO,YOO,ZOO

                          -.383423476890E+07               -.229741172949E+04               -.219675022102E+01
                           .207780589512E+08                .432469532185E+04                .139324201798E+02
                           .140861685853E+06                .443247766411E+04                .425736149216E+02


  FORCES         MAGNITUDE      X       Y      Z      ( EXTERNAL UNITS )         RADIAL          IN-TRACK        CROSS-TRACK
 GEOPOTENTIAL   3.158340E+01  5.731280E+00-3.105832E+01-2.113492E-01-3.158340E+01-7.543195E-04-2.527058E-04
 ATMOSPHERIC    9.009705E-02  1.094590E-02-6.442698E-02-6.202281E-02-6.575565E-02-5.810139E-02-2.044263E-02
 THRUST         6.268362E+01-7.938986E+00  4.505516E+01  4.284699E+01  4.693240E+01  4.022043E+01  1.386341E+01
 TOTAL          4.484920E+01-2.396760E+00  1.393242E+01  4.257361E+01  1.438325E+01  4.016158E+01  1.384271E+01


 STAGE                   T,ST,STAU     H,RHO,MACH,P,VA     LAT,LONG,R,V,AA     ISP,W,COAW,CLAW          XI,WR,WP,WY
 NO. 7                    1.866667      .20360331E+06       .38454428E+00       .29998015E+03        -.12665776E+00
 CONSTANT               112.000000      .46115832E-06       .35999412E+03       .11548500E+06         .71880538E+00
                          0.000000      .61815487E+01       .21129338E+08       .29293695E-03         .68357636E+00
                                        .24818540E-02       .66051456E+04      0.                    0.
                                        .64388106E+04       .45772102E+00                            0.
                                                                                                     0.

 *               STEP    DOUBLED         T  =        1.869840        H  =         .000244       NSTEP  =        411
 *               STEP    DOUBLED         T  =        1.873991        H  =         .000488       NSTEP  =        427
 *               STEP    DOUBLED         T  =        1.882292        H  =         .000977       NSTEP  =        443
 *               STEP    DOUBLED         T  =        1.898893        H  =         .001953       NSTEP  =        459
 *               STEP    DOUBLED         T  =        1.932096        H  =         .003906       NSTEP  =        475
```

```
TSEC =      118.563906    T  =         1.975065    H   =          .003906   NSTEP  =          486

                         X,Y,Z                        XD,YD,ZD                     XDD,YDD,ZDD

                  -.384922588343E+07          -.231285933147E+04          -.255743145381E+01
                   .238164958007E+08           .442215320756E+04           .160586177275E+02
                   .170602656257E+06           .471544839794E+04           .444626616191E+02


  FORCES       MAGNITUDE     X       Y      Z      ( EXTERNAL UNITS )      RADIAL        IN-TRACK      CROSS-TRACK
GEOPOTENTIAL  3.149106E+01 5.728487E+00-3.095460E+01-2.548245E-01-3.149106E+01-8.877133E-04-2.789860E-04
ATMOSPHERIC   3.031712E-02 3.596350E-03-2.125757E-02-2.131455E-02-2.172825E-02-2.006838E-02-6.653651E-07
THRUST        6.544814E+01-8.289515E+00 4.704447E+01 4.473884E+01 4.812664E+01 4.218989E+01 1.368571E+01
TOTAL         4.734288E+01-2.557431E+00 1.605862E+01 4.446266E+01 1.661385E+01 4.215893E+01 1.367877E+01


STAGE                 T,ST,STAU     H,RHO,MACH,P,VA      LAT,LONG,R,V,AA     ISP,W,CDAW,CLAW        XI,WR,WP,WY
NO. 7                 1.975065      .23451026E+06        .46506004E+00       .29999490E+03      -.12665776E+00
CONSTANT            118.503906      .13888424E-06        .35999289E+03       .11060767E+06       .71880538E+00
                      6.503906      .69724422E+01        .21160244E+08       .30164087E-03       .68357636E+00
                                    .63747380E-03        .68658729E+04      0.                   0.
                                    .67071013E+04        .15741246E+01                           0.
                                                                                                 0.

*             STEP    DOUBLED        T   =      1.998503     H   =      .007813     NSTEP   =        491
*             STEP    DOUBLED        T   =      2.568815     H   =      .015625     NSTEP   =        563
*             STEP    DOUBLED        T   =      2.831315     H   =      .031250     NSTEP   =        582
```

```
TSEC =      18..378906    T  =        3.006315    H  =           .031250   NSTEP  =         586

                     X,Y,Z                        XD,YD,ZD                   XDD,YDD,ZDD

              -.400011248067E+07          -.262491720264E+04          -.861493221388E+01
               .211276732021E+08           .631051391112E+04           .511206184833E+02
               .562599189677E+16           .827314231983E+04           .762791813285E+02


 FORCES         MAGNITUDE     X      Y      Z     ( EXTERNAL UNITS )        RADIAL        IN-TRACK      CROSS-TRACK
GEOPOTENTIAL  3.047258E+01 5.666731E+00-2.993037E+01-7.995558E-01-3.047258E+01-2.527709E-03-4.387555E-04
ATMOSPHERIC   1.035905E-06 1.055633E-07-6.427877E-07-8.054691E-07-6.729490E-07-7.738386E-07-1.504130E-07
THRUST        1.127579E+02-1.428166E+01 8.105099E+01 7.707864E+01 8.428978E+01 7.361773E+01 1.383926E+01
TOTAL         9.222816E+01-8.614932E+00 5.112962E+01 7.627908E+01 5.389820E+01 7.361520E+01 1.383882E+01


STAGE                 T,ST,STAU    H,RHO,MACH,P,VA    LAT,LONG,R,V,AA    ISP,W,CDAW,CLAW       X?,WR,WF,WY
NO. 7                  3.006315     .58467941E+06      .15088004E+01      .30000000E+03     -.12665776E+00
CONSTANT             180.378906     .12012368E-11      .35997403E+03      .64200823E+??      .71889538E+00
                      68.378906     .12036283E+02      .21510369E+08      .47351420E-07      .68357636E+00
                                    .32685824E-07      .10731154E+05     0.                 0.
                                    .19640012E+05      .79260581E+01                         0.
                                                                                             0.
```

TSEC =	247.000000	T =	4.116667	H =	.031250	NSTEP =	622

X,Y,Z	XD,YD,ZD	XDD,YDD,ZDD
-.4209[illegible]2756395E+07	-.409508972969E+04	-.589822168859E+02
.217466698666E+08	.148220688719E+05	.337494301321E+03
.136229611196E+07	.181294576360E+05	.345867499614E+03

FORCES	MAGNITUDE	X	Y	Z	(EXTERNAL UNITS) RADIAL	IN-TRACK	CROSS-TRACK
GEOPOTENTIAL	2.862607E+01	5.429254E+00	-2.805118E+01	-1.762413E+00	-2.862607E+01	-5.154654E-03	-3.617778E-04
ATMOSPHERIC	3.040219E-07	3.212708E-08	-1.936998E-07	-2.321154E-07	-2.101540E-07	-2.187214E-07	-2.062929E-08
THRUST	5.085458E+02	-6.441128E+01	3.655455E+02	3.476299E+02	3.917646E+02	3.229610E+02	2.890610E+01
TOTAL	4.868322E+02	-5.898202E+01	3.374943E+02	3.458675E+02	3.631385E+02	3.223558E+02	2.890574E+01

STAGE	T,ST,STAL	H,RHO,MACH,P,VA	LAT,LONG,R,V,AA	ISP,W,CDAW,CLAW	XI,WR,WP,WY
NO. 7	4.116667	.12666302E+07	.35430573E+01	.33000000E+03	-.12665776E+00
CONSTANT	247.000000	.15694309E-13	.35992879E+03	.14235907E+05	.71889538E+00
	135.000000	.26861893E+02	.22192103E+08	.21355813E-02	.68357636E+00
		.71212477E-09	.23772689E+05	0.	0.
		.23745743E+05	.66601955E+01		0.
					0.

```
***  FREE FLIGHT

          * * * * * * * * * * * * * * * * * * *   ECI  * * * * * * * * * * * * * * * * * * * *
SEG18 ENTRY TIME IS    14.19900

 TSEC =        247.000000     T  =         4.116667     H  =           .003906    NSTEP  =          622

                         X,Y,Z                          XD,YD,ZD                      XDD,YDD,ZDD

                  -.420992756395E+07             -.409508972969E+04             .542925433743E+01
                   .217466698666E+08              .148220688719E+05            -.280511831564E+02
                   .136229621196E+07              .181294576360E+05            -.176241280538E+01


  FORCES        MAGNITUDE      X       Y       Z      ( EXTERNAL UNITS )      RADIAL        IN-TRACK      CROSS-TRACK
 GEOPOTENTIAL  2.862607E+01  5.429254E+00-2.805118E+01-1.762413E+00-2.862607E+01-5.154654E-03-3.617778E-04
 ATMOSPHERIC   2.734845E-07  2.658307E-08-1.723323E-07-2.065102E-07-1.869714E-07-1.945937E-07-1.835362E-08
 TOTAL         2.862607E+01  5.429254E+00-2.805118E+01-1.762413E+00-2.862607E+01-5.154849E-03-3.617962E-04


 STAGE                 T,ST,STAU     H,RHO,MACH,P,VA     LAT,LONG,R,V,AA     ISP,W,CDAW,CLAW          XI,WR,WP,WY
 NO. 8                  4.116667      .12666302E+07       .35430573E+01      0.                     -.12665776E+00
 FREE FLIGHT          247.000000      .15694309E-13       .35992879E+03       .10000000E+05          .71860538E+00
                        0.000000      .26861883E+02       .22192103E+08       .19000000E-02          .68357636E+00
                                      .71212477E-09       .23772689E+05      0.                     0.
                                      .23745743E+05       .66601955E+01                             0.
                                                                                                    0.

 *         STEP   DOUBLED          T  =        4.218229      H  =       .007813      NSTEP  =        647
 *         STEP   DOUBLED          T  =        4.351042         =       .015625      NSTEP  =        663
 *         STEP   DOUBLED          T  =        4.616667      H  =       .031250      NSTEP  =        679
 *         STEP   DOUBLED          T  =        5.147917      H  =       .062500      NSTEP  =        695
 *         STEP   DOUBLED          T  =        6.210417      H  =       .125000      NSTEP  =        711
```

```
TSEC =      455.125000    T  =       7.585417    H  =        .125000   NSTEP  =       722

                            X,Y,Z                         XD,YD,ZD                  XDD,YDD,ZDD

                      -.495277400816E+07          -.309059259393E+04          .431202169556E+01
                       .242876764386E+08           .976697315619E+04         -.211394267967E+02
                       .507374050676E+07           .174450958375E+05         -.442721917503E+01


 FORCES        MAGNITUDE     X      Y      Z     ( EXTERNAL UNITS )       RADIAL        IN-TRACK      CROSS-TRACK
GEOPOTENTIAL  2.202428E+01 4.312022E+00-2.113943E+01-4.427209E+00-2.202428E+01-9.645462E-03-6.898423E-04
ATMOSPHERIC   1.450350E-11 9.470552E-13-7.266496E-12-1.251610E-11-9.671156E-12-1.073070E-11-1.293165E-12
TOTAL         2.202428E+01 4.312022E+00-2.113943E+01-4.427209E+00-2.202428E+01-9.645462E-03-6.898423E-04


STAGE                  T,ST,STAL    H,RHO,MACH,P,VA    LAT,LONG,R,V,AA    ISP,W,CDAW,CLAW         XI,WR,WP,WY
NO. 8                   7.585417     .43718419E+07      .11647006E+02      0.                 -.12665776E+00
FREE FLIGHT           455.125000     .11611533E-17      .35963422E+03       .10000000E-05      .71889538E+00
                      208.125000     .22867990E+02      .25294744E+08       .19000000E-02      .68357636E+00
                                     .84622027E-13      .20230593E+05      0.                 0.
                                     .20215166E+05      .16602444E+02                         0.
                                                                                              0.

*             STEP    DOUBLED           T  =       8.335417     H  =       .250000      NSTEP  =      727
*             STEP    DOUBLED           T  =      16.585417     H  =       .500000      NSTEP  =      759
```

```
TSEC =     2885.125000     T  =       48.085417     H   =            .500000     NSTEP  =          822

                         X,Y,Z                            XD,YD,ZD                          XDD,YDD,ZDD

                   -.403230077577E+07              .321067992127E+04              .233621780400E+01
                    .114013367665E+08             -.156926695027E+05             -.660601992485E+01
                    .262898693199E+08             -.343549083446E+04             -.152583668317E+02


 FORCES        MAGNITUDE      X       Y      Z     ( EXTERNAL UNITS )        RADIAL         IN-TRACK       CROSS-TRACK
GEOPOTENTIAL  1.679033E+01  2.336218E+00-6.606020E+00-1.525837E+01-1.679033E+01-1.063766E-02-1.807568E-07
ATMOSPHERIC   2.083489E-14-5.170835E-15  1.969874E-14  4.394857E-15  1.247432E-14-1.665074E-14-1.112176E-15
TOTAL         1.679033E+01  2.336218E+00-6.606020E+00-1.525837E+01-1.679033E+01-1.063766E-02-1.807568E-07


STAGE                    T,ST,STAU    H,RHO,MACH,P,VA     LAT,LONG,R,V,AA     ISP,W,CDAW,CLAW          XI,WR,WP,WY
NO. 8                    48.085417     .80701690E+07       .65443395E+02      0.                    -.12665776E+00
FREE FLIGHT            2885.125000     .25697565E-20       .35742859E+03       .10000000E+05         .71889538E+00
                       2638.125000     .18424087E+02       .28937958E+08       .19000000E-02         .58357636E+00
                                       .25564904E-15       .16382031E+05      0.                    0.
                                       .16286782E+05       .14878560E+03                            0.
                                                                                                    0.


*                STEP    HALVED          T  =      58.116667      H   =      .031250     NSTEP  =       843
*                STEP    HALVED          T  =      58.337370      H   =      .001953     NSTEP  =       851
*                STEP    DOUBLED         T  =      58.385198      H   =      .003906     NSTEP  =       875
*                STEP    DOUBLED         T  =      58.452604      H   =      .007813     NSTEP  =       891
```

```
TSEC =    3521.687500    T  =    58.694792    H  =    .007813    NSTEP  =    922

                    X,Y,Z                     XD,YD,ZD                  XDD,YDD,ZDD

            -.166732935561E+07         -.140043390622E+03         .341867385106E+01
             .945211344875E+06          .396515264094E+03        -.769078914648E+01
             .201907323820E+08         -.396445296446E+03        -.272822308426E+02


 FORCES       MAGNITUDE    X        Y        Z     ( EXTERNAL UNITS )    RADIAL      IN-TRACK    CROSS-TRACK
GEOPOTENTIAL 3.219067E+01 2.562390E+00-1.452622E+00-3.205563E+01-3.219067E+01 7.514197E-03 5.882027E-03
ATMOSPHERIC  7.901473E+00 8.562898E-01-6.238167E+00 4.773396E+00 4.402453E+00-6.426181E+00 1.325098E+00
TOTAL        2.855093E+01 3.418680E+00-7.690789E+00-2.728223E+01-2.778822E+01-6.413667E+00 1.330980E+00


STAGE               T,ST,STAU   H,RHO,MACH,P,VA   LAT,LONG,R,V,AA   ISP,W,CDAW,CLAW     XI,WR,WP,WY
NO. 8               58.694792    .22711804E+05     .84768075E+02    0.                 -.12665777E+00
FREE FLIGHT       3521.687500    .11549419E-02     .35743894E+02     .10000000E+03      .71880538E+00
                  3274.687500    .63980809E+00     .20878888E+08     .93751885E-03      .68357636E+00
                                 .60269598E+01     .57793198E+03    0.                 0.
                                 .65624157E+03     .80313335E+02                       0.
                                                                                       0.

*          STEP    DOUBLED       T  =    58.905729     H  =     .015625     NSTEP  =     948

   ***  CRASH  ***         ALTITUDE  =     -73.7      TIME  =     59.26510
```

```
TSEC =     3555.90625C    T  =      59.265104    H  =        .015625    NSTEP  =        971


                     X,Y,Z                       XD,YD,ZD                    XDD,YDD,ZDD

              -.167?2847464 8E+07          -.445051684661E+02         .155285287701E+01
               .952864961547E+06            .469037335772E+02        -.837465445471E+01
               .207672681752E+08           -.799623060046E+03         .60656'861740E+00


  FORCES        MAGNITUDE     X       Y       Z     ( EXTERNAL UNITS )      RADIAL        IN-TRACK      CROSS-TRACK
GEOPOTENTIAL  3.226082E+01 2.575318E+00-1.469169E+00-3.212428E+01-3.226081E+01 9.535701E-03 1.316452E-03
ATMOSPHERIC   3.346699E+01-1.022455E+00-6.905486E+00 3.273084E+01 3.235781E+01-6.378252E+00 5.685878E+00
TOTAL         8.538977E+00 1.552863E+00-8.374654E+00 6.065609E-01 9.699672E-02-6.368716E+00 5.687195E+0'


STAGE                T,ST,STAL   H,RHO,MACH,P,VA   LAT,LONG,R,V,AA   ISP,W,CDAW,CLAW      XI,WR,WP,WY
NO. 8                59.265104    -.73664165E+02     .84744933E+02    0.                 -.12665776E+00
FREE FLIGHT        3555.906250     .23820223E-02     .35445970E+02     .10000000E+05      .71880538E+00
                   3398.9?625(     .73214200E+00     .20856108E+08     .13064905E-02      .68357636E+00
                                   .14735135E+02     .80223295E+03    0.                 0.
                                   .81760725E+03     .12160724E+03                       0.
                                                                                         0.

      ***  VEHICLE CRASHED

      ***  THIS CASE TOCK      2.008  SECONDS TO INTEGRATE A SFAN OF      59.2651  MINUTES  ***

         ***  FROM          0.000  TO        59.265  MINUTES FROM MIDNIGHT OF EPOCH  ***

ENTER SEGMENT 50 AT     14.9 SECONDS. EXECUTION TIME FOR SEGMENT  10 WAS     2.0 CP SECS
```

*** TRACE66 EPHEMERIS OUTPUT KEY ***

OATE,...	ME,MM,ST,DT	X,XD	X,XO - BF	ADBARV	LAT,...	REV,...	REMARK
YR/MO/DAY	MIN FROM EPOCH	X (FT)	X (FT)	ALPHA (OEG)	LATITUOE (DEG)	REV COUNT	.
HR/MIN	MIN FROM MICNIGHT	Y (FT)	Y (FT)	DELTA (OEG)	LONCITUOE (OEG)	PERIOO	.
SEC	SEC FROM MIDNIGHT	Z (FT)	Z (FT)	BETA (DEG)	ALTITUOE (NM)	PERIOO-OECAY	.
	STEP SIZE (MIN)	XO (FT/SEC)	XO (FT/SEC)	AZIMUTH (OEG)	S-VEH-LAT (DEG)	NOD-REG	.
IT	UTC - IT	YO (FT/SEC)	YD (FT/SEC)	R (FT)	I (DEG)		
	UT1 - IT	ZO (FT/SEC)	ZD (FT/SEC)	V (FT/SEC)	O (DEG)		

SPECIAL OUTPUT OPTICNS RECUESTEO

C APOGEE-PERIGEE
G SPECIAL ALTITUOES

*** ECI TRAJECTCRY ***

```
*** CASE      1
***


***  STAGE NO. 1        POWERED FLIGHT.

*** EPOCH PRINT

DATE,...  ME,MM,ST,DT,..          X,XD              X,XD - BF            ADBARV            LAT,.. BF        REV,...
71/ 1/ 1        0.00000  -.363129650E+07    .209257380E+08      99.99327240       0.00000000       .50000
  0/ 0          0.00000   .206082555E+08   -.148686311E-06       0.00000000     360.00000000      0.00000
 0.00000        0.00000  0.                 0.                  90.00000000       -.00000000      0.00000
                 .01563  -.150277774E+04   -.121001230E-10      90.00000000       0.00000000      0.00000
IT              0.00000  -.264798324E+03    .953505180E-05    .209257380E+08        .00000000
                0.00000  -.134595352E-10   -.134595352E-10    .152559289E+04     180.00000000

  A  =   .10481007E+08     MEAN ANOM  =     .18000000E+03     APOGEE   =    .34439336E+04
  E  =   .99653893E+00     ECCENTRIC  =     .18000000E+03     HEIGHT   =   -.72759576E-11
  I  =   .50538039E-12     TRUE ANOM  =     .18000000E+03     PERIGEE  =    .59701863E+01
  O  =   .27999327E+03     KEPL PER   =     .29947727E+02     HEIGHT   =   -.34379634E+04
  U  =   .36000000E+03     ANOM PER   =     .29923367E+02     D-DOT    =   -.23468143E+07
TAU  =  -.14973864E+02     NODL PER   =    -.80903654E+04     U-DOT    =    .46936286E+07
```

```
***  REQUESTED PRINTS

DATE,...  ME,MM,ST,DT,..        X,XD            X,XD - BF          ADBARV            LAT,.. BF        REV,...
71/ 1/ 1        0.00000   -.363129650E+07    .209257380E+08    99.99327240       0.00000000       .50000 DSC NODE
 0/ 0           0.00000    .206082555E+08   -.148686311E-06     0.00000000     360.00000000      0.00000
 0.00000        0.00000   0.                0.                 90.00000000      -.00000000       0.00000
                 .01563   -.150277774E+04   -.121001230E-10    90.00000000       0.00000000      0.00000
IT              0.00000   -.264798324E+03    .953505180E-05    .209257385+08      .00000914
                0.00000   -.134595352E-10   -.134595352E-10    .152592895+04    180.00000000

DATE,...  ME,MM,ST,DT,..        X,XD            X,XD - BF          ADBARV            LAT,.. BF        REV,...
71/ 1/ 1         .00000   -.363129650E+07    .209257380E+08    99.99327240       0.00000000       .50000
 0/ 0           0.00000    .206082555E+08   -.148686311E-06     0.00000000     360.00000000      0.00000
 0.00000         .00000   0.                0.                 90.00000000      -.00000000       0.00000
                 .01563   -.150277774E+04   -.121001230E-10    90.00000000       0.00000000      0.00000
IT              0.00000   -.264798324E+03    .953505180E-05    .209257385+08      .00000914
                 .00000   -.134595352E-10   -.134595352E-10    .152592895+04    180.00000000

DATE,...  ME,MM,ST,DT,..        X,XD            X,XD - BF          ADBARV            LAT,.. BF        REV,...
71/ 1/ 1         .00000   -.363129650E+07    .209257380E+08    99.99327240      -.00000000        .50000 BETA =90
 0/ 0            .00000    .206082555E+08   -.148686311E-06    -.00000000      360.00000000      0.00000
  .00000         .00000   -.951225545E-23   -.951221801E-23    90.00000000      -.00000000       0.00000
                 .01563   -.150277774E+04   -.121001230E-10    90.00000000      -.00000000       0.00000
IT              0.00000   -.264798324E+03    .953505180E-05    .209257385+08      .00000914
                0.00000   -.134596270E-10   -.134595352E-10    .152592895E+04   180.00000000

DATE,...  ME,MM,ST,DT,..        X,XD            X,XD - BF          ADBARV            LAT,.. BF        REV,...
71/ 1/ 1         .16667   -.364648055E+07    .209266463E+08   100.03505926      -.00000002        .50012 PRE-EVNT
 0/ 0            .16667    .206064967E+08   -.135198329E+01    -.00000002      359.99939712      0.00000
10.00000        1.00000   -.648979944E-02   -.648979944E-02    83.00445863        .149+9128      0.00000
                 .01563   -.153495604E+04    .187208891E+03    90.00004871      -.00000002       0.00000
IT              0.00000   -.815050274E+02   -.319594589E+00    .209266465+08      .00004871
                0.00000   -.129721395E-02   -.129721395E-02    .153711845+04    179.97909818
```

** STAGE NO2 POWERED FLIGHT

DATE,...	ME,MM,ST,DT,..	X,XD	X,XD - BF	ADBARV	LAT,.. BF	REV,...
71/ 1/ 1	.16667	-.364648055E+07	.209266463E+08	100.03505026	-.00000002	.50012 PST-EVNT
0/ 0	.16667	.206064967E+08	-.105198329E+01	-.00000002	359.99999712	0.00000
10.00000	10.00000	-.648979944E-02	-.648979944E-02	83.00445863	.14949128	0.00000
	.00195	-.153495604E+04	.187208891E+03	90.00004871	-.00000002	0.00000
IT	0.00000	-.815150274E+02	-.319594589E+00	.209266646E+08	.00004871	
	0.00000	-.129721395E-02	-.129721395E-02	.153711184E+04	179.97909818	

DATE,...	ME,MM,ST,DT,..	X,XD	X,XD - BF	ADBARV	LAT,.. BF	REV,...
71/ 1/ 1	.16088	-.364594764E+07	.209265825E+08	100.03359944	-.00000010	1.00000 ASC NODE
0/ 0	.16088	.206065262E+08	-.944889931E+00	-.00000010	359.99999741	0.00000
9.65268	9.65268	-.380570178E-01	-.380570178E-01	83.26653577	.13899276	0.00000
	.00195	-.153374241E+04	.180131102E+03	89.98966829	-.00000010	0.00000
IT	.00000	-.884386592E+02	-.297220364E+00	.209265583E+08	.00468976	
	0.00000	.275116281E+00	.275116281E+00	.15362901E+04	.00127042	

DATE,...	ME,MM,ST,DT,..	X,XD	X,XD - BF	ADBARV	LAT,.. BF	REV,...
71/ 1/ 1	.18333	-.364801727E+07	.209268438E+08	100.03922736	.00000209	1.00002 PRE-EVNT
0/ 0	.18333	.206064253E+08	-.140552410E+01	.00000208	359.99999615	0.00000
11.00000	11.00000	.759617574E+00	.759617574E+00	82.24440256	.18199226	0.00000
	.00195	-.153848227E+04	.207779937E+03	89.91353307	.00000209	0.00000
IT	.00000	-.613513300E+02	-.388646428E+00	.209268844E+08	.08649693	
	0.00000	.230317250E+01	.230317250E+01	.153970685E+04	359.99861851	

** STAGE NO3 POWERED FLIGHT

DATE,...	ME,MM,ST,DT,..	X,XD	X,XD - BF	ADBARV	LAT,.. BF	REV,...
71/ 1/ 1	.18333	-.364801727E+07	.209268438E+08	100.03922736	.00000209	1.00002 PST-EVNT
0/ 0	.18333	.206064253E+08	-.140552410E+01	.00000208	359.99999615	0.00000
11.00000	11.00000	.759617574E+00	.759617574E+00	82.24440256	.18139226	0.00000
	.00024	-.153848227E+04	.207779937E+03	89.91353307	.00000209	0.00000
IT	0.00000	-.613513300E+02	-.388646428E+00	.209268844E+08	.08649693	
	0.00000	.230317250E+01	.230317250E+01	.153970685E+04	359.99861851	

DATE,...	ME,MM,ST,DT,..	X,XD	X,XD - BF	ADBARV	LAT,.. BF	REV,...
71/ 1/ 1	.27751	-.365676934E+07	.209283591E+08	100.06282704	.00024393	1.00008 PRE-EVNT
0/ 0	.27751	.206064129E+08	-.497880143E+01	.00024229	359.99998637	0.00000
16.65080	16.65080	.885024035E+02	.885024035E+02	77.76944963	.43136952	0.00000
	.00391	-.155951933E+04	.330671819E+03	88.91321737	.00024393	0.00000
IT	0.00000	.590851819E+02	-.915797851E+00	.209283359E+08	1.08678265	
	0.00000	.289348450E+02	.289348450E+02	.156099966E+04	359.98721403	

** STAGE NO4 POWERED FLIGHT

DATE,...	ME,MM,ST,DT,..	X,XD	X,XD - BF	ADBARV	LAT,.. BF	REV,...
71/ 1/ 1	.27751	-.365676934E+07	.209283591E+08	100.06282704	.00024393	1.00008 PST-EVNT
0/ 0	.27751	.216064129E+08	-.497880143E+01	.00024229	359.99998637	0.00000
16.65080	16.65080	.885024035E+02	.885024035E+02	77.76944963	.43136952	0.00000
	.00049	-.155951933E+04	.330671819E+03	88.91321737	.00024393	0.00000
IT	0.00000	.590891819E+02	-.915797851E+00	.209283359E+08	1.08678265	
	.00000	.239348450E+02	.239348450E+02	.156090665E+04	359.98721493	

DATE,...	ME,MM,ST,DT,..	X,XD	X,XD - BF	ADBARV	LAT,.. BF	REV,...
71/ 1/ 1	1.83333	-.382962957E+07	.211194722E+08	100.44733648	.36051912	1.00152 PRE-EVNT
0/ 1	1.83333	.207693536E+08	-.203619817E+04	.35810607	359.99447592	0.00000
50.00000	110.00000	.132001167E+06	.132001167E+06	44.39255546	31.95291160	0.00000
	.01563	-.230522133E+04	.471172581E+04	18.60042295	.36049673	0.00000
IT	0.00000	.436610387E+04	-.652191264E+02	.211198855E+08	71.39995367	
	.00000	.441316756E+04	.441316756E+04	.662215615E+04	359.87395734	

** STAGE NO5 POWERED FLIGHT

DATE,...	ME,MM,ST,DT,..	X,XD	X,XD - BF	ADBARV	LAT,.. BF	REV,...
71/ 1/ 1	1.83333	-.382962957E+07	.211194722E+08	100.44733648	.36051912	1.00152 PST-EVNT
0/ 1	1.83333	.207693536E+08	-.203619817E+04	.35810607	359.99447592	0.00000
50.00000	110.00000	.132001167E+06	.132001167E+06	44.39255546	31.95291160	0.00000
	.00195	-.230522133E+04	.471172581E+04	18.60042295	.36049673	0.00000
IT	0.00000	.436610387E+04	-.652191264E+02	.211198855E+08	71.39995367	
	.00000	.441316756E+04	.441316756E+04	.662215615E+04	359.87395794	

DATE,...	ME,MM,ST,DT,..	X,XD	X,XD - BF	ADBARV	LAT,.. BF	REV,...
71/ 1/ 1	1.84333	-.383101277E+07	.211222999E+08	100.44973745	.36771767	1.00154 PRE-EVNT
0/ 1	1.84333	.207719739E+08	-.207550356E+04	.36525644	359.99437005	0.00000
50.60000	110.60000	.134654957E+06	.134654957E+06	44.39599709	32.42135625	0.00000
	.00195	-.230545133E+04	.471396926E+04	18.52105861	.36769451	0.00000
IT	0.00000	.436827993E+04	-.657995004E+02	.211227729E+08	71.47933142	
	0.00000	.443285238E+04	.443285238E+04	.663680030E+04	359.87210867	

```
**    STAGE N06        FREE FLIGHT

DATE,...  ME,MM,ST,DT,..           X,XD          X,XD - BF          ADBARV          LAT,.. BF        REV,...
71/ 1/ 1          1.84333   -.383101277E+07   .211222999E+08    100.44973745        .36771767     1.00154 PST-EVNT
 0/ 1             1.84333    .207719739E+08  -.207550356E+04       .36525644     359.99437905     0.00000
50.60000        110.60000    .134654957E+06   .134654957E+06     44.39593709      32.42135625     0.00000
                   .00024   -.230545103E+04   .471396926E+04     18.52105861        .36769451     0.00000
IT                0.00000    .436827993E+04  -.657995004E+02    .211227295E+08     71.47933142
                  0.00000    .443285238E+04   .443285238E+04    .66368030E+04     359.87210867


DATE,...  ME,MM,ST,DT,..           X,XD          X,XD - BF          ADBARV          LAT,.. BF        REV,...
71/ 1/ 1          1.86667   -.383423477E+07   .211288685E+08    100.45533689        .38454428     1.00158 PRE-EVNT
 0/ 1             1.86667    .207780590E+08  -.216829048E+04       .38197044     359.99412018     0.00000
52.00000        112.00000    .140860686E+06   .140860686E+06     44.64680220      33.50879573     0.00000
                   .00098   -.229741173E+04   .466979315E+04     18.52144592        .38451926     0.00000
IT                0.00000    .432469532E+04  -.667517840E+02    .211293385E+08     71.47898062
                  0.00000    .443247766E+04   .443247766E+04    .66051456E+04     359.86615682

**    STAGE N07        POWERED FLIGHT

DATE,...  ME,MM,ST,DT,..           X,XD          X,XD - BF          ADBARV          LAT,.. BF        REV,...
71/ 1/ 1          1.86667   -.383423477E+07   .211288685E+08    100.45533689        .38454428     1.00158 PST-EVNT
 0/ 1             1.86667    .207780590E+08  -.216829048E+04       .38197044     359.99412018     0.00000
52.00000        112.00000    .140860686E+06   .140860686E+06     44.64680220      33.50879573     0.00000
                   .00012   -.229741173E+04   .466979315E+04     18.52144592        .38451926     0.00000
IT                0.00000    .432469532E+04  -.667517840E+02    .211293385E+08     71.47898062
                  0.00000    .443247766E+04   .443247766E+04    .66051456E+04     359.86615682

DATE,...  ME,MM,ST,DT,..           X,XD          X,XD - BF          ADBARV          LAT,.. BF        REV,...
71/ 1/ 1          2.50926   -.392502172E+07   .213229035E+08    100.69722986        .93713644     1.00304 ALTITUDE
 0/ 2             2.50926    .209585412E+08  -.560987777E+04       .93076557     359.98432596     0.00000
30.55537         15.55537    .346419427E+06   .346419427E+06     48.79672439      65.83132101     0.00000
                   .00781   -.242912835E+04   .549683473E+04     13.03154002        .93691791     0.00000
IT                0.00000    .513751109E+04  -.114406799E+03    .213257195E+08     77.06326025
                  0.00000    .632016311E+04   .632016311E+04    .84993614E+04     359.77110465

DATE,...  ME,MM,ST,DT,..           X,XD          X,XD - BF          ADBARV          LAT,.. BF        REV,...
71/ 1/ 1          -.11667   -.420902756E+07   .221502326E+08    100.95404915       3.54305730     1.01010 PRE-EVNT
 0/ 4             +.11667    .217466699E+08  -.275284719E+05      3.51940193     359.92879242     0.00000
 7.00000        247.00000    .136229621E+07   .136229621E+07     46.33324252     208.46052340     0.00000
                   .03125   -.409508973E+04   .153296421E+05      4.01470358       3.54169824     0.00000
IT                0.00000    .148220689E+05  -.430311423E+03    .221921035E+08     85.99238026
                  0.00000    .181294576E+05   .181294576E+05    .23772689E+05     359.68194109
```

** STAGE NO8 FREE FLIGHT

DATE,...	ME,MM,ST,DT,..	X,XD	X,XD - BF	ADBARV	LAT,.. BF	REV,...
71/ 1/ 1	4.11667	-.420902756E+07	.221502326E+08	100.95404915	3.54305730	1.01010 PS1-EVNT
0/ 4	4.11667	.217466699E+08	-.275284719E+05	3.51940193	359.92809242	0.00000
7.00000	247.00000	.136229621E+07	.136229621E+07	46.33324252	208.46052340	0.00000
	.00391	-.199508973E+04	.153296421E+05	4.01470358	3.54159824	0.00000
IT	0.00000	.148220689E+05	-.430311423E+03	.22192103E+08	85.39288026	
	0.00000	.181294576E+05	.181294576E+05	.23772689E+05	359.68194109	

DATE,...	ME,MM,ST,DT,..	X,XD	X,XD - BF	ADBARV	LAT,.. BF	REV,...
71/ 1/ 1	10.00000	-.535725302E+07	.260410757E+08	101.87111104	16.27262178	1.04520
0/10	1.00000	.254656666E+08	-.285896245E+06	16.16941149	359.37009410	0.00000
0.00000	600.00000	.755101321E+07	.755101321E+07	50.30390244	1019.56372863	0.00000
	.25000	-.250593693E+04	.730032520E+04	4.17329894	16.24833785	0.00000
IT	0.00000	.694337280E+04	-.955244885E+03	.27115257E+08	86.00253432	
	0.00000	.167316140E+05	.167316140E+05	.18287620E+05	358.20997309	

DATE,...	ME,MM,ST,DT,..	X,XD	X,XD - BF	ADBARV	LAT,.. BF	REV,...
71/ 1/ 1	20.00000	-.626639554E+07	.276216554E+08	103.19523879	31.01306034	1.08606
0/20	20.00000	.269170814E+08	-.917136080E+06	30.84341104	355.09827732	0.00000
0.00000	1200.00000	.165032787E+08	.165032787E+08	65.13077807	1856.80055089	0.00000
	.50000	-.636203950E+03	-.137313681E+04	4.67150321	30.95347740	0.00000
IT	1.00000	-.152293522E+04	-.100535374E+04	.32189365E+08	85.98811216	
	0.00000	.129543823E+05	.129543823E+05	.13059101E+05	355.69736548	

DATE,...	ME,MM,ST,DT,..	X,XD	X,XD - BF	ADBARV	LAT,.. BF	REV,...
71/ 1/ 1	30.00000	-.620301387E+07	.248964075E+08	104.40571346	42.81886468	1.11891
0/30	30.00000	.241491464E+08	-.135186798E+07	42.62707544	356.89199746	0.00000
0.00000	1800.00000	.229489000E+08	.229489000E+08	88.80033478	2138.41488247	0.00000
	.50000	.807797859E+03	-.744067525E+04	5.45554943	42.74530274	0.00000
IT	1.00000	-.744407440E+04	-.345639678E+03	.33886733E+08	85.97824063	
	0.00000	.839962769E+04	.839962769E+04	.11252579E+05	353.18151679	

DATE,...	ME,MM,ST,DT,..	X,XD	X,XD - BF	ADBARV	LAT,.. BF	REV,...
71/ 1/ 1	30.46080	-.617982377E+07	.246872878E+08	104.47423928	43.34255598	1.12037 BETA =90
0/30	30.46080	.239400040E+08	-.136082056E+07	43.15051870	356.84491671	0.00000
27.64828	1827.64828	.231779503E+08	.231779503E+08	89.99999998	2139.05619986	0.00000
	.50000	.869667865E+03	-.768607748E+04	5.50227972	43.26888890	0.00000
IT	1.00000	-.768434860E+04	-.331786151E+03	.33889990E+08	85.90722200	
	1.00000	.816887289E+04	.816887289E+04	.11248823E+05	352.99875142	

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DATE,...  ME,MM,ST,DT,..        X,XD              X,XD - BF          ADBARV            LAT,.. BF          REV,...
71/ 1/ 1      40.00000   -.532247715E+07    .189215416E+08     106.30196864       54.46367021       1.15147
  0/40         4..00000   .181991311E+08   -.122979671E+07      54.28147881      356.28131809       0.00000
 0.00000    2400.00000    .263696781E+08    .263696781E+08     113.01680808     1909.07518547       0.00000
                .50000    .212152567E+04   -.123394318E+05       6.88479785       54.39869198       0.00000
IT             0.00000   -.122645884E+05    .825788879E+03     .32479179E+08       85.97384661
               0.00000    .275350575E+04    .275350575E+04     .12747658E+05      350.66392397

DATE,...  ME,MM,ST,DT,..        X,XD              X,XD - BF          ADBARV            LAT,.. BF          REV,...
71/ 1/ 1      50.00000   -.364770982E+07    .102241106E+08     110.89338712       68.49908177       1.19104
  0/50        50.00000    .955571695E+07   -.291676494E+06      68.36754050      358.36589294       0.00000
 0.00000    3000.00000    .257909635E+08    .257909635E+08     128.77783877     1132.30783299       0.00000
                .50000    .348247104E+04   -.165352889E+05      10.94809311       68.46658268       0.00000
IT             0.00000   -.164337566E+05    .233391386E+04     .27745113E+08       85.97558601
               0.00000   -.528348324E+04   -.528348324E+04     .17609973E+05      348.14763412

DATE,...  ME,MM,ST,DT,..        X,XD              X,XD - BF          ADBARV            LAT,.. BF          REV,...
71/ 1/ 1      57.73839   -.176316900E+07    .194796138E+07     142.80980743       84.06338754       1.23782 ALTITUDE
  0/57        57.73839    .133784248E+07    .105073019E+07      84.02337916       28.34241935       0.00000
44.30322    3464.30322    .211408533E+08    .211408533E+08     133.94875247       65.83955548       0.00000
                .50000    .465090148E+04   -.188284286E+05      42.27186987       84.06234386       0.00000
IT             0.00000   -.186539368E+05    .335071274E+04     .21256394E+08       85.97660146
               0.00000   -.157932975E+05   -.157932975E+05     .24880283E+05      346.13242812

DATE,...  ME,MM,ST,DT,..        X,XD              X,XD - BF          ADBARV            LAT,.. BF          REV,...
71/ 1/ 1      70.52121   -.532465122E+16    .198675710E+17     104.41408869       40.82340990       1.11341 BETA =90
  1/10        70.52121    .195474318E+17   -.355285970E+16      40.63314858      349.86113391       0.00000
31.27278    4231.27278    .173189692E+17    .173189692E+17       .00001183*320587.53125000        0.00000
                .03125   -.337717893E+14    .133550268E+15       1.58747422       40.63314818       0.00000
IT             0.00000    .131398287E+15   -.238824198E+14     .26594922E+17       41.77011922
               0.00000    .116418561E+15    .116418560E+15     .17877171E+15      275.96732881

DATE,...  ME,MM,ST,DT,..        X,XD              X,XD - BF          ADBARV            LAT,.. BF          REV,...
71/ 1/ 1      58.49359   -.166539023E+07    .154898781E+07     150.56035928       84.78039672       1.24073 BETA =90
  0/58        58.49359    .939917806E+06    .112143972E+07      84.74542953       35.90365360       0.00000
29.61531    3509.61531    .207933952E+08    .207933952E+08      89.99999768        4.10932927       0.00000
                .00781   -.181513069E+03    .592691162E+03     219.68206260       84.78035423       0.00000
IT             0.00000    .478851345E+03   -.147758025E+03     .20881146E+08       93.34636740
               0.00000   -.361831513E+02   -.361831513E+02     .51337591E+03      176.42546380

DATE,...  ME,MM,ST,DT,..        X,XC              X,XD - BF          ADBARV            LAT,.. BF          REV,...
71/ 1/ 1      59.26355   -.167028459E+07    .156655643E+07     150.29613526       84.74496754       1.24061 *CRASH*
  0/59        59.26355    .952860555E+06    .111520467E+07      84.70975662       35.44641190       0.00000
15.81307    3555.81307    .237673427E+08    .237673427E+08     170.15115998        -.00000000       0.00000
                .01563   -.446501753E+02    .143355999E+03     188.08189942       84.74496659       0.00000
IT             0.00000    .476852404E+02   -.937581765E+02     .20856181E+08       90.72249595
               0.00000   -.799678312E+03   -.799678312E+03     .80234215E+03      297.61835725
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DATE,...  ME,MM,ST,OT,..        X,XO              X,XO - BF          ADBARV           LAT,.. BF        REV,...
71/ 1/ 1       59.26510   -.167028475E+07   .156656975E+07   150.29608254      84.74493305     1.24061 PRE-EVNT
  0/59         59.26510    .952864962E+06   .111519594E+07    84.70972190      35.44596989     0.00000
15.90625     3555.90625    .207672682E+08   .207672682E+08   170.19291151       -.01212356     0.00000
                 .01563   -.445051685E+02   .142585416E+03   187.86028726      84.74493222     0.00000
IT              0.00000    .469037336E+02  -.935627250E+02   .208561085E+08    90.72247930
                0.00000   -.799623060E+03  -.799623060E+03   .802232955E+03   207.61874875

        **   VEHICLE CRASHED

DATE,...  ME,MM,ST,OT,..        X,XO              X,XO - BF          ADBARV           LAT,.. BF        REV,...
71/ 1/ 1       59.26510   -.167028475E+07   .156656975E+07   150.29608254      84.74493305     1.24061 PRE-EVNT
  0/59         59.26510    .952864962E+06   .111519594E+07    84.70972190      35.44596983     0.00000
15.90625     3555.90625    .207672682E+08   .207672682E+08   170.19291151       -.01212356     0.00000
                 .01563   -.445051685E+02   .142585416E+03   187.86028726      84.74493222     0.00000
IT              0.00000    .469037336E+02  -.935627250E+02   .208561085E+08    90.72247930

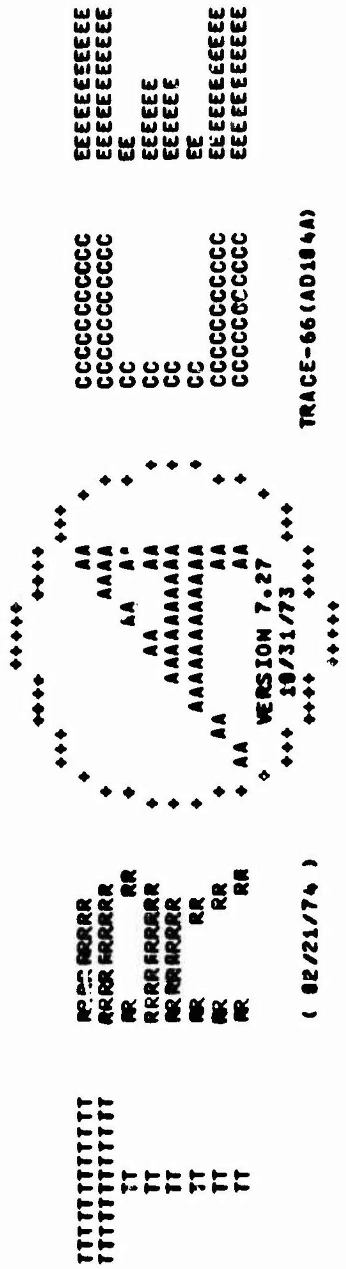
                0.00000   -.799623060E+03  -.799623060E+03   .802232955E+03   207.61874875

  A   =    .10433128E+08     MEAN ANOM  =    .18493051E+03    APOGEE  =    .34340636E+04
  E   =    .93997235E+00     ECCENTRIC  =    .18246567E+03    HEIGHT  =    .15781792E+01
  I   =    .90722479E+02     TRUE ANOM  =    .18000917E+03    PERIGEE =    .47475385E-01
  O   =    .32246886E+03     KEPL PER   =    .29742324E+02    HEIGHT  =   -.34324379E+04
  U   =    .27523168E+03     ANOM PER   =    .29790353E+02    O-DOT   =    .46957538E+09
 TAU  =    .43986596E+02     NCOL PER   =    .31748549E+08    U-DOT   =   -.18605385E+11

        ***  END OF TRAJECTORY  ***

EXIT SEGMENT 50 AT     15.3 SECONDS.  EXECUTION TIME FOR SEGMENT 50 WAS      .4 CP SECS.
```

C.7 TEST CAST F: ECI SIMULTANEOUS-VEHICLE ORBIT DETERMINATION RUN (ITIN = 2)



```
MODEL DATA
H       SCF MODEL
INFORM1                      INTERM41                       MTERMS04,60                                CARD   1
D       02,00                         -1.0827E-3                     0.                                 CARD   2
D       03,00                         2.676E-6                       0.                                 CARD   3
D       04,00                         1.4E-6                         0.                                 CARD   4
D       05,00                         2.8E-8                         0.                                 CARD   5
D       06,00                         -3.7E-7                        0.                                 CARD   6
D       07,00                         5.93E-7                        0.                                 CARD   7
D       08,00                         -7.0E-8                        0.                                 CARD   8
D       02,02                         1.537068E-6                    -7.73676E-7                        CARD   9
D       03,01                         1.991856E-6                    2.309483E-7                        CARD  10
D       03,02                         4.162717E-7                    -2.318633E-7                       CARD  11
D       03,03                         9.20555E-8                     1.36403E-7                         CARD  12
D       04,01                         -5.344208E-7                   -4.181365E-7                       CARD  13
D       04,02                         9.32884E-8                     9.90846E-8                         CARD  14
D       04,03                         5.056823E-8                    4.233845E-10                       CARD  15
D       04,04                         -4.432373E-9                   4.033772E-9                        CARD  16
D       05,01                         1.168464E-7                    -1.424087E-7                       CARD  17
D       05,02                         4.3475E-8                      -5.451493E-8                       CARD  18
D       05,03                         3.028423E-9                    3.45103E-9                         CARD  19
D       05,04                         -3.801453E-9                   -2.025287E-9                       CARD  20
D       05,05                         -8.3892E-11                    -1.648367E-9                       CARD  21
D       06,01                         -2.746737E-13                  7.8695E-8                          CARD  22
D       06,02                         -2.000628E-8                   -1.927374E-8                       CARD  23
D       06,03                         1.097921E-8                    1.057274E-9                        CARD  24
D       06,04                         -1.158042E-9                   -1.922802E-9                       CARD  25
D       06,05                         -1.424538E-10                  -4.115213E-10                      CARD  26
D       06,06                         3.199373E-12                   -5.391516E-11                      CARD  27
D       07,01                         9.22074E-8                     6.81522E-8                         CARD  28
D       07,02                         4.564422E-8                    6.000909E-9                        CARD  29
D       07,03                         5.555012E-9                    -2.905979E-9                       CARD  30
D       07,04                         -2.9078E-10                    -2.030027E-15                      CARD  31
D       07,05                         -2.003164E-11                  -6.59991E-11                       CARD  32
D       07,06                         -3.15577E-11                   5.2589E-11                         CARD  33
D       07,07                         1.625731E-12                   -2.675614E-12                      CARD  34
D       08,01                         -1.013559E-7                   -3.29912E-8                        CARD  35
D       08,02                         7.74717E-9                     -3.09899E-9                        CARD  36
D       08,03                         -5.548181E-10                  2.184649E-9                        CARD  37
D       08,04                         -8.95304E-11                   4.924497E-11                       CARD  38
D       08,05                         1.458971E-11                   -3.101689E-13                      CARD  39
                                                                                                        CARD  40
```

1 CONT'D

ITEM	DESCRIPTION	REFERENCE SECTION
1	Card images of the input MODEL data. Emphasis is given to the variables associated with an SLS run (MULTV=2), the others having been discussed earlier:	
	MULTV, LPACK	2.2.11
	PANDR PATA, GPLØT, SSPR, MVET	2.2.11.1
	ELEDD, KEDIT, FEDIT, NEDIT	2.2.11.3
	JSGLS	2.2.11.4
	GMKM, ERKM, F, ØMEGE, ØMEGA, GSUB0, FTNM, FTKM, SLT, PI, DGREE	2.1.1
	MSGLS, FREQ, CNTI, ISGLS, PSGLS	2.2.9
	D1, D2	2.1.2.4.1
	CLASS	2.2.1
	LGT	2.2.5
	UTD, LEMSP	2.1.4
	ACØN, RCØN	2.2.2

```
D      08,06                  -6.224239E-13            1.858458E-11             CARD  41
D      08,07                   8.65738E-13            -3.585277E-13             CARD  42
D      08,08                  -1.858297E-13            1.202444E-13             CARD  43
 GMKM 398601.2           ERKM -6378.145           F     .3352891869E-2          CARD  44
 OMEGE.4375269088E-2     OMEGA.4375269088E-2      GSUB0.3208766404E+2          CARD  45
 FTNM 6076.115486        FTKM 3280.839895         SLT   2820.185179            CARD  46
 PI   3.1415926536       DGREE57.295779512              1.047197551216         CARD  47
IPSGLS2                  FREQ 1.779736E9          CNT1 1048754.                CARD  48
TISGLS0                 IJSGLS6                  IPSGLS2                       CARD  49
 PLANT0                  CLASS1                  ILGT   -1                     CARD  50
IPAXIT5                  ACON 0.                  RCON 1.E-3                   CARD  51
 UTD   41.1579           PATA 3                  DITIN 2                       CARD  52
IPULTV2                 DOP30X4001                LEMSP3                       CARD  53
 D1    7.18              D2    -15.738            FLUX 0.                      CARD  54
DFANDR            XX    DSSPR XX                                               CARD  55
 GPLOT4                       10                 IKSIG 1                       CARD  56
I2     2                I3     3                 I4     37                     CARD  57
 SIGMA20                 2     0                  3     0                      CARD  58
 4     .1                                                                      CARD  59
IPVET 2                 ILPACK1                   ELED00                       CARD  60
 NEDIT5                  FEDIT5                   KEDIT.5                      CARD  61
END                                                                            CARD  62
```

①

```
****************************************** EARTH   GRAVITY MODEL ******************************************

GM =  .5530417752E-02 ER**3/MIN**2  =  .1407646853E+17 FT**3/SEC**2  =  .3986012000E+15 M**3/SEC**2
          NO NORMALIZATION WITH  41 TERMS.
```

N	M	CNM	SNM	**	N	M	CNM	SNM
2	0	-.10827000E-02	0.	**	4	3	.50568230E-07	.42338450E-09
3	0	.26760000E-05	0.	**	5	3	.30284230E-08	.34510300E-08
4	0	.14000000E-05	0.	**	6	3	.10979210E-07	.10572740E-08
5	0	.28000000E-07	0.	**	7	3	.55550120E-08	-.29059790E-08
6	0	-.37000000E-06	0.	**	8	3	-.55481810E-09	.21846490E-08
7	0	.59300000E-06	0.	**	4	4	-.44323730E-08	.40337720E-08
8	0	-.70000000E-07	0.	**	5	4	-.38014530E-08	-.20252870E-08
3	1	.19918560E-05	.23094830E-06	**	6	4	-.11580420E-08	-.19228020E-08
4	1	-.53442080E-06	-.41813650E-06	**	7	4	-.29978000E-09	-.20300270E-14
5	1	.11684640E-06	-.14240870E-06	**	8	4	-.89539400E-10	.49244970E-10
6	1	-.27462370E-12	.78695000E-07	**	5	5	-.83892000E-10	-.16493670E-08
7	1	.92207400E-07	.68152200E-07	**	6	5	-.14245380E-09	-.41152130E-09
8	1	-.10135590E-06	-.32991200E-07	**	7	5	-.20031640E-10	-.65909100E-10
2	2	.15370680E-05	-.77367600E-06	**	8	5	.14589710E-10	-.31036890E-12
3	2	.41627170E-06	-.23186330E-06	**	6	6	.31993730E-11	-.53915160E-10
4	2	.93288400E-07	.99084600E-07	**	7	6	-.31557700E-10	.52589000E-10
5	2	.43475900E-07	-.54514030E-07	**	8	6	-.62242390E-12	.18584580E-10
6	2	-.20006280E-07	-.19273740E-07	**	7	7	.16257310E-11	-.26756140E-11
7	2	.45644220E-07	.60009090E-08	**	8	7	.86573800E-12	-.35852770E-12
8	2	.77471700E-08	-.30989900E-08	**	8	8	-.18582970E-12	.12024440E-12
3	3	.92055500E-07	.13640300E-06	**				

```
****************************** GENERAL PERTURBATIONS GRAVITY MODEL ****************************

GM =  .5530417744E-02 ER**3/MIN**2  =  .1407646851E+17 FT**3/SEC**2  =  .3986011994E+15 M**3/SEC**2

                    **** ZONAL HARMONICS ****

EJ2 =  .1082549000E-02      EJ3 =-.2435000000E-05      EJ4 = -.1232000000E-05

****************************************** PHYSICAL CONSTANTS *****************************************

GM(ER**3/MIN**2)    =   .553041775E-02   OMEGE(RAD/MIN) =   .437526909E-02  GMLAT(DEG)    =   .783000000E+02
GMKM(KM**3/SEC**2)  =   .398601200E+06   OMEGA(RAD/MIN) =   .437526909E-02  GMLNG(DEG)    =   .291000000E+03
SGM(ER**3/MIN**2)   =   .680232650E-04   OMEGL(RAD/MIN) =  0.                AM(ER)        =   .272506277E+00
ERFT(FT/ER)         =   .209256726E+08   ERKM(KM/ER)    =   .637814599E+04  ERNM(NM/ER)   =   .344392279E+04
FTKM(FT/KM)         =   .328083989E+04   FTNM(FT/NM)    =   .607611549E+04  AE(ER)        =   .100000000E+01
GSUB0(FT/SEC**2)    =   .321876640E+02   DGREE(DEG)     =   .572957795E+02  SLT(ER/MIN)   =   .282018318E+04
CKEP                =   .100000000E-10   F              =   .335289187E-02  PI            =   .314159265E+01

****************************************** INPUT/OUTPUT CONVERSION FACTORS ******************************

DF(I/O-ER) =   .20925673E+08   VF(I/O-ER/MIN) =   .34876121E+06   AF(I/O-ER/MIN**2) =   .58126868E+04

****************************************** INTEGRATION INPUTS *****************************************

                         ICENT =    1             NSTEP =   2
  NPCMP =    0            IR    =    8             ER    =  .10000000E-09
  HMIN  =  .15625000E-01  HMAX  =  .64000000E+02   H0    =  .10000000E+01
```

```
******************************************** SPECIAL OPTIONS ********************************************
 TAPE2  =   0     TAPE7  =   0     TELEM  =   0     PTAPE  =   0     NPDOT  =    0
 PRHD   =   0     NODPR  =   0     CLASS  =   1     LEMSP  =   3     PTNS   =10000

***************************************** CRASH ALTITUDE TABLE *****************************************
                                                (IN FT)

 ECI CRASH ALTITUDE =     .300000000E+06            MCI CRASH ALTITUDE =     .300000000E+04

*********************************** INTERPLANETARY CRASH ALTITUDES TABLE ***********************************
                                                 (IN FT)

 BODY(1) CRASH ALTITUDE =     .300000000E+06        BODY(2) CRASH ALTITUDE =   0.
 BODY(3) CRASH ALTITUDE =     .300000000E+04        BODY(4) CRASH ALTITUDE =   0.
 BODY(5) CRASH ALTITUDE =   0.                      BODY(6) CRASH ALTITUDE =   0.
 BODY(7) CRASH ALTITUDE =   0.

********************************************* STATION LOCATIONS *********************************************
STATION     SIG   REF   RA-RBF   DATUM   TYPE       LATITUDE          LONGITUDE          HEIGHT        P     Q
                                                       X                  Y                 Z
                                                     RADIUS            LATITUDE          LONGITUDE

 313        -0    -0      -0      -0      -0
 343        -0    -0      -0      -0      -0
 353        -0    -0      -0      -0      -0
 363        -0    -0      -0      -0      -0
 377        -0    -0      -0      -0      -0
 393        -0    -0      -0      -0      -0

************************************************* ATA INPUT *************************************************

      AT4   6.64827257E+4       2    1.68260013E+4      3    4.72859549E+4          CARD  1
      4     5.61307652E+4       5    5.46561358E+3      6    5.75322855E+4          CARD  2
      7     1.40434853E+2       8    4.24344483E+1      9    1.11908831E+2          CARD  3
      10    3.04659013E-1      11    3.45640484E+1     12    6.18612704E+1          CARD  4
      13    2.05906071E+1      14    7.94214544E-2     15    8.79832056E-2          CARD  5
      16    6.77190160E+1      17    4.31726187        18    6.12078389E+1          CARD  6
      19    1.42139627E-1      20    1.78260973E-2     21    7.63605610E-2          CARD  7
      22    -4.67529268E-2     23    -1.03299161E-2    24    -2.65828841E-2         CARD  8
      25    -9.57123720E-5     26    -2.29471783E-5    27    -2.82997265E-5         CARD  9
      28    2.69009967E-7                                                         CARD 10
     END                                                                          CARD 11
```

ITEM	DESCRIPTION	REFERENCE SECTION
2	Printout of the station locations as input. If CLASS$\neq$0, the actual locations are left blank	4
3	Card images of the input A^TA matrix data. In this case, $(A^TA)^{-1}$ is input because ØPBØX(A)=4	6

```
********************************************** DEWM INPUT ***************************************************

     MDWT 0                                                                              CARD    1
     ADWT 2                  PTYP 1                  OSDEWTYES                           CARD    2
     SDRG .0355              SDCG .0346               FERI 89.5                          CARD    3
     PSTSD28.CE-5            DPH  5.0                 PRESD0                             CARD    4  (4)
     KDRS .3017              KDTS .3017               KDCS .3017                         CARD    5
    END                                                                                  CARD    6

ENTER SEGMENT 01 AT      1.5 SECONDS. EXECUTION TIME FOR SEGMENT  0 WAS      1.5 CP SECS.

************************************* VEHICLE DATA FOR CASE  1 *****************************************

    MVPRAM04,6"                                                                          CARD    1
    D      X                     20.                      0.                             CARD    2
    D      Y                     20.                      0.                             CARD    3
    D      Z                     20.                      0.                             CARD    4
    D      DX                    1.                       0.                             CARD    5
    D      DY                    1.                       0.                             CARD    6
    D      DZ                    1.                       0.                             CARD    7
    D      DRAG                  .1                       0.                             CARD    8
    IIDRAG1                 DRAG 9.21746269382517E-3 INCDAW0                             CARD    9
     START1970              2    6                    3    26                            CARD   10
     4     0                5    0                    6    2945.474                      CARD   11
     4     12               5    1                    6    17.18592                      CARD   12
    IVEHID6820             IYEAR 1970                IMNTH 6                             CARD   13
    IDAY   26               TZNE 0                     HR  12                            CARD   14
     MIN   1                SEC  17.18502            IICTYP4                             CARD   15  (5)
     IC    270.7883984      2    -.000551476          3    88.946165659                  CARD   16
     4     198.847449630    5    21561464.324         6    25690.5594806                 CARD   17
     FTIM 0.                2    1.                   3    721.18592                     CARD   18
     4     7.               5    1000.                                                   CARD   19
    INPKCK1                 PKCK 2507.9064333333      2    1.                            CARD   20
     3     -.15717854       4    30.16990             5    .2307999                      CARD   21
     DNODE20.               2    9.                   3    43277.185                     CARD   22
     4     48611.259        5    54044.693            6    59427.551                     CARD   23
     7     64809.871        8    70191.651            9    75572.998                     CARD   24
     10    80953.858        11   86334.067            12   5313.922                      CARD   25
     13    10693.093        14   16071.740            15   21449.836                     CARD   26
     16    26827.276        17   32204.094            18   37580.475                     CARD   27
     19    42956.330        20   48331.657            21   53706.294                     CARD   28
     22    59080.318                                                                     CARD   29
    END                                                                                  CARD   30
```

ITEM	DESCRIPTION	REFERENCE SECTION
4	Card images of the deweighting inputs	7
5	Card images of the input VEHICLE data. Emphasis is on the variables associated with an SLS run (MULTV=2), the others having been discussed earlier:	
	START	11.2.2
	NCDAW	11.1.9
	NPKCK, PKCK	11.1.11
	DNØDE	11.2.3

INITIAL CONDITIONS

EPOCH YR/MC/DAY TZNE,HR,MIN,SEC	X,Y,Z,DX,DY,DZ	A,D,B,A,R,V	A,E,I,O,U,TAU	AF,AG,N,L,CHI,PSI
1970/ 6/26	.21469037556E+08	.53370435033E+01	.21800278170E+08	.12286862127E-01
0.	.19942843795E+07	-.55147600000E-03	.21406144937E-01	-.17528721006E-01
.12000000000E+02	-.20753064537E+03	.88946165659E+02	.10884744963E+03	.66784616507E-01
.10000000000E+01	.12377377639E+04	.19884744963E+03	.18530723175E+03	.31944959249E+01
.17185020000E+02	-.82186686159E+04	.21561464324E+08	.11972153345E+03	-.12931050634E+00
	-.24308976487E+05	.25690559481E+05	.70677066628E+03	-.13929146541E+01

NO PLANETARY PERTURBATIONS.

** NO ATMOSPHERE MODEL **

****

THESE ARE THE 13 PARAMETERS IN THE PARAM MATRIX. 7 ARE P PARAMETERS AND 6 ARE Q PARAMETERS

	NAME	P/Q	CURRENT VALUE	BOUND	SIGMA	CONVERSION
6820	X	P	.21469038E+08	.20000000E+02	0.	.20925673E+08
6820	Y	P	.19942844E+07	.20000000E+02	0.	.20925673E+08
6820	Z	P	-.20753065E+03	.20000000E+02	0.	.20925673E+08
6820	DX	P	.12377378E+04	.10000000E+01	0.	.34876121E+06
6820	DY	P	-.82186686E+04	.10000000E+01	0.	.34876121E+06
6820	DZ	P	-.24308976E+05	.10000000E+01	0.	.34876121E+06
6820	DRAG	P	.92174627E-02	.10000000E+00	0.	.10000000E+01
393	RBIA	Q	.12000000E+04	.10000000E+05	.50000000E+02	.20925673E+08
377	RBIA	Q	.14000000E+04	.10000000E+05	.50000000E+02	.20925673E+08
363	RBIA	Q	.12000000E+04	.10000000E+05	.50000000E+02	.20925673E+08
353	RBIA	Q	.12000000E+04	.10000000E+05	.50000000E+02	.20925673E+08
343	RBIA	Q	.14800000E+04	.10000000E+05	.50000000E+02	.20925673E+08
313	RBIA	Q	.12000000E+04	.10000000E+05	.50000000E+02	.20925673E+08

ENTER SEGMENT 02 AT 1.6 SECONDS. EXECUTION TIME FOR SEGMENT 1 WAS .1 CP SECS.

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** DATA STAGING INPUT **

LS/F	NDELTA	DELTA T	D	TSTART YR	MO	DY	HR	MN	SEC	TSTOP YR	MO	DY	HR	MN	SEC	TUPDATE YR	MO	DY	HR	MN	SEC
-0.	-0.	-0.000	1	0	0	0	0	0	0.0000	0	0	0	0	0	0.0000	70	6	26	13	31	0.0000
-0.	-0.	-0.000	0	0	0	0	0	0	0.0000	0	0	0	0	0	0.0000	70	6	26	14	39	0.0000
-0.	-0.	-0.000	1	0	0	0	0	0	0.0000	0	0	0	0	0	0.0000	70	6	26	15	0	0.0000
-0.	-0.	-0.000	1	0	0	0	0	0	0.0000	0	0	0	0	0	0.0000	70	6	26	16	30	0.0000
-0.	-0.	-0.000	0	0	0	0	0	0	0.0000	0	0	0	0	0	0.0000	70	6	26	17	43	0.0000
-0.	-0.	-0.000	1	0	0	0	0	0	0.0000	0	0	0	0	0	0.0000	70	6	26	18	0	0.0000

6

****

**OBSERVATIONS FOR CASE 1 **

** STAGE 1 **

** STAGE 2 **

** STAGE 3 **

STA	PASS	YR	MO	DY	HR	MN	SECONDS	T	C	FIELD 1	FIELD 2	FIELD 3	MJD	ST	VEHID	MESSAGE
393	16	70	6	26	14	39	20.0000	1	0	0.	1.11338000E+02	4.07300000E+00	40763	52760.000	6820	
393	16	70	6	26	14	39	20.0000	0	0	-1.66357133E+04	0.	0.	40763	52760.000	6820	
393	16	70	6	26	14	39	36.0000	1	0	0.	1.17219000E+02	5.09400000E+00	40763	52776.000	6820	
393	16	70	6	26	14	39	36.0000	0	0	-1.46059925E+04	0.	0.	40763	52776.000	6820	
393	16	70	6	26	14	40	28.0000	1	0	2.65523622E+06	1.42646000E+02	7.14700000E+00	40763	52828.000	6820	
393	16	70	6	26	14	40	28.0000	0	0	-4.42319686E+03	0.	0.	40763	52828.000	6820	
393	16	70	6	26	14	41	12.0000	1	0	2.71175853E+06	1.67816000E+02	6.69300000E+00	40763	52872.000	6820	
393	16	70	6	26	14	41	12.0000	0	0	6.51818603E+03	0.	0.	40763	52872.000	6820	
393	16	70	6	26	14	41	24.0000	1	0	2.80812664E+06	1.74087000E+02	6.17200000E+00	40763	52884.000	6820	
393	16	70	6	26	14	41	24.0000	0	0	9.16173820E+03	0.	0.	40763	52884.000	6820	
313	16	70	6	26	14	51	12.0000	1	0	1.54888780E+06	5.20920000E+01	1.51530000E+01	40763	53472.000	6820	
313	16	70	6	26	14	51	12.0000	0	0	-2.20899318E+04	0.	0.	40763	53472.000	6820	
313	16	70	6	26	14	51	44.0000	1	0	9.57660763E+05	8.00630000E+01	2.76470000E+01	40763	53504.000	6820	
313	16	70	6	26	14	51	44.0000	0	0	-1.31763271E+04	0.	0.	40763	53504.000	6820	
313	16	70	6	26	14	52	40.0000	1	0	1.29941929E+06	1.69412000E+02	1.96350000E+01	40763	53560.000	6820	
313	16	70	6	26	14	52	40.0000	0	0	1.98337706E+04	0.	0.	40763	53560.000	6820	
313	16	70	6	26	14	53	4.0000	1	0	1.82430118E+06	1.81266000E+02	1.27740000E+01	40763	53584.000	6820	
313	16	70	6	26	14	53	4.0000	0	0	2.31371122E+04	0.	0.	40763	53584.000	6820	
313	16	70	6	26	14	54	4.0000	1	0	3.29320539E+06	1.92343000E+02	4.29000000E+00	40763	53644.000	6820	
313	16	70	6	26	14	54	4.0000	0	0	2.51645637E+04	0.	0.	40763	53644.000	6820	

7 CONT'D

ITEM	DESCRIPTION	REFERENCE SECTION
6	Printout of the input STAGE data	14
	LS/F = M	
7	Observations. The observation printout is fully explained in Case B, Item 3	11.2.1 15 11.1.2

** STAGE 4 **

STA	PASS	YR	MO	DY	HR	MN	SECONDS	T	C	FIELD 1	FIELD 2	FIELD 3	MJD	ST	VEHID	MESSAGE
393	17	70	6	26	16	7	20.0000	1	0	0.	1.15749000E+02	3.67590000E+00	40763	58040.000	6820	
393	17	70	6	26	16	7	20.0000	0	0	-2.13349341E+04	0.	0.	40763	58040.000	6820	
393	17	70	6	26	16	8	4.0000	1	0	2.78503609E+06	1.29323000E+02	7.19390000E+00	40763	58084.000	6820	
393	17	70	6	26	16	8	4.0000	0	0	-1.74967044E+04	0.	0.	40763	58084.000	6820	
393	17	70	6	26	16	8	28.0000	1	0	2.41137139E+06	1.40589000E+02	5.15200000E+00	40763	58108.000	6820	
393	17	70	6	26	16	8	28.0000	0	0	-1.36019328E+04	0.	0.	40763	58108.000	6820	
393	17	70	6	26	16	9	0.0000	1	0	2.10335958E+06	1.60903000E+02	1.11460000E+01	40763	58140.000	6820	
393	17	70	6	26	16	9	0.0000	0	0	-5.46453380E+03	0.	0.	40763	58140.000	6820	
393	17	70	6	26	16	10	4.0000	1	0	2.40062008E+06	2.05002000E+02	8.68590000E+00	40763	58204.000	6820	
393	17	70	6	26	16	10	4.0000	0	0	1.31430709E+04	0.	0.	40763	58204.000	6820	

** STAGE 5 **

** STAGE 6 **

STA	PASS	YR	MO	DY	HR	MN	SECONDS	T	C	FIELD 1	FIELD 2	FIELD 3	MJD	ST	VEHID	MESSAGE
343	18	70	6	26	17	44	20.0000	1	0	2.72901903E+06	6.66380000E+01	5.88300000E+00	40763	63860.000	6820	
343	18	70	6	26	17	44	20.0000	0	0	-2.16764518E+04	0.	0.	40763	63860.000	6820	
343	18	70	6	26	17	44	40.0000	1	0	2.33840223E+06	7.44520000E+01	7.92400000E+00	40763	63880.000	6820	
343	18	70	6	26	17	44	40.0000	0	0	-1.83778783E+04	0.	0.	40763	63880.000	6820	
343	18	70	6	26	17	45	56.0000	1	0	1.70083990E+06	1.32517000E+02	1.27960000E+01	40763	63956.000	6820	
343	18	70	6	26	17	45	56.0000	0	0	4.92450460E+03	0.	0.	40763	63956.000	6820	
343	18	70	6	26	17	46	36.0000	1	0	2.16558399E+06	1.61521000E+02	8.87490000E+00	40763	63996.000	6820	
343	18	70	6	26	17	46	36.0000	0	0	1.64988081E+04	0.	0.	40763	63996.000	6820	
343	18	70	6	26	17	47	32.0000	1	0	3.29381890E+06	1.81541000E+02	3.41400000E+00	40763	64052.000	6820	
343	18	70	6	26	17	47	32.0000	0	0	2.23990942E+04	0.	0.	40763	64052.000	6820	

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```
ENTER SEGMENT 10 AT      1.7 SECONDS.  EXECUTION TIME FOR SEGMENT  2 WAS      .1 CP SECS.

 **********************************  TRAJECTORY INTEGRATION FOR CASE    1  **********************************


                                        * PREDETERMINED EVENT TABLE *
 TIME(MME)     TYPE        ASSOCIATED QUANTITIES
    721.2864 TZERO
   1000.0000 TSTOP

        ***  TRAJECTORY START

        * * * * * * * * * * * * * * * * * * * *   ECI  * * * * * * * * * * * * * * * * * * * *
SEG11 ENTRY TIME IS      1.76800
 *               STEP   DOUBLED          T  =     725.161417        H  =        .250000       NSTEP  =        30
 *               STEP   DOUBLED          T  =     729.411417        H  =        .500000       NSTEP  =        46
   NODE  T =      .767215124957E+03   -.218988769959E+08   -.206721431610E+07   -.596669999758E-02
         DT =     .500000000000E+00   -.293957797174E+03    .814209479171E+04    .239278350350E+05
   NODE  T =      .811021379897E+03    .214626327053E+08    .205980494718E+07   -.156772048110E-02
         DT =     .500000000000E+00    .126203942993E+04   -.821494114192E+04   -.243083525139E+05
   NODE  T =      .856943296633E+03   -.218897494540E+08   -.213361809193E+07   -.100460622573E-02
         DT =     .500000000000E+00   -.319621427110E+03    .814270198243E+04    .238298363451E+05
   NODE  T =      .900745999142E+03    .214559397449E+08    .212517332048E+07   -.102826795647E-01
         DT =     .500000000000E+00    .128685765377E+04   -.821173714187E+04   -.243076958174E+05
 *               STEP   DOUBLED          T  =     944.911417        H  =       1.000000       NSTEP  =       476
   NODE  T =      .946662334323E+03   -.218804033990E+08   -.220038223137E+07    .920682420941E-02
         DT =     .100000000000E+01   -.344844680157E+03    .814299617733E+04    .238319337227E+05
   NODE  T =      .990460717663E+03    .214491984352E+08    .219036484338E+07   -.183453992340E+00
         DT =     .100000000000E+01    .131171317581E+04   -.820836995990E+04   -.243069111568E+05

        ***  TRAJECTORY TERMINATION


        ***  THIS CASE TOOK      1.404  SECONDS TO INTEGRATE A SPAN OF    279.6250  MINUTES  ***

            ***  FROM        721.286  TO       1000.911  MINUTES FROM MIDNIGHT OF EPOCH  ***

ENTER SEGMENT 81 AT     3.2 SECONDS.  EXECUTION TIME FOR SEGMENT 10 WAS     1.4 CP SECS.

ENTER SEGMENT 82 AT     3.2 SECONDS.  EXECUTION TIME FOR SEGMENT 81 WAS      .1 CP SECS.
```

ITEM	DESCRIPTION	REFERENCE SECTION
8	Predetermined event table indicating the first integration time span. This time span covers all stages	
	TSTART, TSTØP	11.2.2

```
************************************************  STAGE  1  ************************************************

STAPASS   YEAR MO DY HR MN  SEC                    RESIDUALS - EXTERNAL UNITS                    MME

          SUMMARY OF PREDICTED STATISTICS
 STA  TYP        RMS        TYP       RMS        TYP       RMS        TYP       RMS

PREDICTED RESIDUAL RMS =  0.

ENTER SEGMENT 83 AT     3.2 SECONDS.  EXECUTION TIME FOR SEGMENT 82 WAS     .0 CP SECS.

ITERATION NUMBER     1
    0 MEASUREMENTS WERE USED IN THIS SOLUTION
CURRENT SOLUTION IS

NAME              CURRENT VALUE           CORRECTION      NEW VALUE              TOTAL CORR.     SIGMA
6820    X          .21469037555645E+08 -0.             .21469037555645E+08   0.               .25784244E+03
6820    Y          .19942843794999E+07 -0.             .19942843794999E+07   0.               .21745334E+03
6820    Z         -.20753064537446E+03 -0.            -.20753064537446E+03   0.               .23985889E+03
6820    DX         .12377377639201E+04 -0.             .12377377639201E+04   0.               .55195925E+00
6820    DY        -.82186686159199E+04 -0.            -.82186686159199E+04   0.               .29661963E+00
6820    DZ        -.24308976486797E+05 -0.            -.24308976486797E+05   0.               .27633415E+00
6820    DRAG       .92174626938252E-02 -0.             .92174626938252E-02   0.               .51866171E-03

NAME              SIGMA ZERO          SIGMA DEWT      TOTAL CORR.     T.C./SIGMAP      T.C./SIGMAD
6820    X          0.                  .25784244E+03  0.              0.               0.
6820    Y          0.                  .21745334E+03  0.              0.               0.
6820    Z          0.                  .23985889E+03  0.              0.               0.
6820    DX         0.                  .55195925E+00  0.              0.               0.
6820    DY         0.                  .29661963E+00  0.              0.               0.
6820    DZ         0.                  .27633415E+00  0.              0.               0.
6820    DRAG       0.                  .51866171E-03  0.              0.               0.

RESIDUAL  RMS =    0.
RESIDUAL  SOS =    0.
APRIORI   RMS =    0.
APRIORI   SOS =    0.
TOTAL     SOS =    0.
PREDICTED SOS =    0.
```

1

ITEM	DESCRIPTION	REFERENCE SECTION
	The current solution is shown one parameter per line, starting with the name (Test Case B, Item 4)	2.2.3
	The current value is the parameter value used in the integration, partial derivatives, and residuals computation just completed. For the first iteration, it is the input value of the parameter. If an iteration is bad, the value produced for the lowest RMS is recovered from memory and is printed as the current value	
	The correction is the least squares correction to be applied to the current value for the next iteration	
	The new value is the sum of the current value plus the correction. This value will be used on convergence of this stage and will be updated to the next stage for all nonvehicle parameters. The current value is used for the vehicle parameters	
	The total correction is the value used to correct the parameters at this stage. This value includes the current correction	
	SIGMA is the square root of the diagonal elements of the covariance matrix $(A^TA)^{-1}$ for the parameters at the end of this iteration	
	SIGMA ZERO is the square root of the diagonal elements of the initial $(A^TA)^{-1}$ before deweighting for this stage	
	SIGMA DEWT is the square root of the diagonal elements of the deweighted $(A^TA)^{-1}$ at the start of this iteration	
	T. C. /SIGMA0 is the total correction/SIGMA ZERO	
	T. C. /SIGMAD is the total correction/SIGMA DEWT	
	The current value, correction, new value, total correction and SIGMA are normal least squares output. SIGMA ZERO, SIGMA DEWT, T. C. /SIGMA0, and T. C. /SIGMAD are extended least squares output and are obtained when PANDR(15)≠0	2.2.11.1
	Residual RMS is the weighted root mean square residuals for the current iteration	2.2.4
	Residual SCS is the sum of squares of the normalized measurement residuals for the current iteration	
	A priori RMS is the weighted root mean square total of the parameter corrections for the previous iterations for the current stage	
	A priori SCS is the sum of the squares of the total parameter corrections for the previous iterations for the current stage	
	Total SCS is the sum of the residual SCS + a priori SCS	
	Predicted SOS is the predicted sum of the normalized measurement residuals squared	2.2.2

****** LEAST SQUARES PROCESS CONVERGED ******

ATA

		6820 X	6820 Y	6820 Z	6820 DX	6820 DY	6820 DZ	6820 DRAG	
6820	X	.27234E-02							
6820	Y	.17085E-03	.52365E-03						
6820	Z	-.65088E-03	.16370E-03	.45841E-03					
6820	DX	-.84361E+00	.30592E-02	.35395E+00	.44390E+03				
6820	DY	-.20527E+00	-.43786E+00	-.20210E+00	-.84265E+02	.42806E+03			
6820	DZ	-.25873E+00	-.21456E+00	-.40959E+00	-.34107E+03	.41722E+03	.19966E+04		
6820	DRAG	.70767E+02	.79205E+01	.42212E+01	.34712E+04	-.21921E+05	-.64479E+05	.93397E+07	
	ATB	-0.	-0.	-0.	-0.	-0.	-0.	-0.	0.

ATA INVERSE

		6820 X	6820 Y	6820 Z	6820 DX	6820 DY	6820 DZ	6820 DRAG
6820	X	.66483E+05						
6820	Y	.16826E+05	.47286E+05					
6820	Z	.56131E+05	.54656E+04	.57532E+05				
6820	DX	.14043E+03	.42434E+02	.11191E+03	.30466E+00			
6820	DY	.34564E+02	.61861E+02	.20591E+02	.79421E-01	.87983E-01		
6820	DZ	.67719E+02	.43173E+01	.61208E+02	.14214E+00	.17826E-01	.76361E-01	
6820	DRAG	-.46753E-01	-.10330E-01	-.26583E-01	-.95712E-04	-.22947E-04	-.28209E-04	.26901E-06

CORRELATION MATRIX

6820	X	1.00000						
6820	Y	.30010	1.00000					
6820	Z	.90759	.10479	1.00000				
6820	DX	.98676	.35355	.84528	1.00000			
6820	DY	.45193	.95978	.28941	.48510	1.00000		
6820	DZ	.95043	.07185	.92346	.93191	.21748	1.00000	
6820	DRAG	-.34960	-.09159	-.21368	-.33433	-.14916	-.19676	1.00000

ENTER SEGMENT 84 AT 3.3 SECONDS. EXECUTION TIME FOR SEGMENT 83 WAS .0 CP SECS.
ATA INVERSE UPDATED TO 611.02 MINUTES FROM MIDNIGHT OF EPOCH

		6820 X	6820 Y	6820 Z	6820 DX	6820 DY	6820 DZ	6820 DRAG
6820	X	.55687E+05						
6820	Y	.67521E+05	.21730E+06					
6820	Z	.20658E+06	.49044E+06	.14791E+07				
6820	DX	.32434E+03	.75470E+03	.21726E+04	.32479E+01			
6820	DY	.50349E+02	.15119E+03	.28152E+03	.44207E+00	.13083E+00		
6820	DZ	.52631E+02	.53557E+02	.20548E+03	.32502E+00	.35908E-01	.76683E-01	
6820	DRAG	-.45064E-01	-.15666E+0	-.45517E+00	-.66094E-03	-.77576E-04	-.30061E-04	.25901E-06

10

ITEM	DESCRIPTION	REFERENCE SECTION
10	<u>A^TA</u> is the current A^TA matrix for this iteration	
	<u>A^TB</u> is the right-hand side of the normal matrix equation for the generalized least squares (GLS) problem when a priori statistics are included in the GLS solution of the linear system. The equation to be solved is $$(C_0^{-1} + A^TWA)\Delta P = A^TWB$$ where $A = \frac{\partial O_c}{\partial P}$ W = observation weighting matrix P = vector of parameter corrections B = residual vector (A^TWO_{mc}) for the last iteration	
	<u>A^TA inverse</u> is the covariance for the parameter set at this iteration. It is the inverse of the A^TA matrix above	
	<u>Correlation matrix</u>, the correlation coefficients for the parameter set. These values are computed directly from the covariance matrix	
	<u>A^TA inverse updated</u> is the covariance for the parameter set updated to the time of the next iteration	

```
G AND G DEWEIGHTING MATRICES FOR VEHICLE 6820

ORBIT PLANE COORDINATE SYSTEM

   .33140E+05
  -.28250E-18   .39768E+06
  0.            0.            .31481E+05
   .63892E-1.  -.38779E+03   0.            .40832E+00
  -.38775E+.2   .33054E-21   0.           -.74757E-13    .45369E-01
  0.            0.            .60694E-10   0.            0.              .43098E-01
```

11

```
PARAMETER SET COORDINATE SYSTEM

   .76445E-1
  -.79472E-11   .15841E-09
  -.24448E-10   .25451E-09    .82090E-09
  -.17971E-11   .16992E-10    .50052E-10    .33296E-11
   .15439E-11   .17956E-11    .48041E-11    .28538E-12    .38366E-12
   .50051E-11   .48086E-12    .14962E-14   -.46504E-15    .56905E-14    .37105E-12
```

12

```
**** ORBITAL ELEMENTS FOR VEHICLE     1 FOR NEXT DATA STAGE ****

 YEAR/MO/DY            X            ALPHA              A                  AF         MEAN ANOMALY    APOGEE RADIUS
     HR/MIN            Y            DELTA              E                  AG       ECCENTRC ANOM    APOGEE HEIGHT
    SECONDS            Z             BETA              I                   N        TRUE ANOMALY   PERIGEE RADIUS
   LATITUDE         XDOT          AZIMUTH              O                   L       KEPLERIAN PER   PERIGEE HEIGHT
  LONGITUDE         YDOT           RADIUS              U                 CHI         ANOMALY PER            O-DOT
     HEIGHT         ZDOT         VELOCITY            TAU                 PSI        NODAL PERIOD            U-DOT

 1970/ 6/26   21462602.415      5.482511795   21738793.913   .0122805196989       58.2461818      3664.19037
      13/31   2060302.054        .391549899    .0213429l985  -.0174559177234       59.2350534б       228.10053
  1.2588030       583.249      88.948443245  108.847926486   .0667914375674       60.35334034      3511.04979
   .0015603   1262.7637290    198.847926491  185.481982716     3.371622844        89.8318739        74.95996
248.4688068  -8214.8716254     21561236.311  119.645021943    -.133556689З8       89.5929426      2.792565280Э
  104.6003  -24308.3525001     25689.9725442     796.4870267  -1.3916260239Z      89.7251141     -2.0666905725

LEAST SQUARES PROCESS CONVERGED.

EXIT SEGMENT 84 AT      3.3 SECONDS.  EXECUTION TIME FOR SEGMENT 84 WAS      .0 CP SECS.
```

ITEM	DESCRIPTION	REFERENCE SECTION
11	Deweighting matrix in the orbit plane coordinate system (RTC). The values in this matrix are used to deweight the A^TA matrix. This deweighting allows for the uncertainty in the unmodeled parameters. Units are external	
12	Parameter set coordinate system is the RTC deweighting matrix converted to the parameter set coordinate system (ECI). This converted matrix is added to the updated A^TA inverse matrix. Units are external	

```
ENTER SEGMENT 10 AT      3.3 SECONDS.  EXECUTION TIME FOR SEGMENT 84 WAS       .1 CP SECS.

 *********************************** TRAJECTORY INTEGRATION FOR CASE    1  ***********************************

                                                   * PREDETERMINED EVENT TABLE *
 TIME(MME)     TYPE        ASSOCIATED QUANTITIES
    811.0210 TZERO
    882.0000 TSTOP

        ***  TRAJECTORY START

        * * * * * * * * * * * * * * * * * * * *    ECI   * * * * * * * * * * * * * * * * * * * *
SEG11 ENTRY TIME IS     3.36700
   NODE  T =       .811021379896E+03     .214626327051E+08     .205980494770E+07     .161588981064E-04
        DT =       .125000000000E+00     .126203943514E+04    -.821494114187E+04    -.243983525152E+05
 *               STEP    DOUBLED         T  =    814.895980      H  =       .250000     NSTEP  =        30
 *               STEP    DOUBLED         T  =    819.145980      H  =       .500000     NSTEP  =        46
   NODE  T =       .356943296365E+03    -.218897494550E+08    -.213361809386E+07    -.537143593949E-02
        DT =       .500000000000E+00    -.319621436737E+03     .814270198170E+04     .238298363442E+05

        ***  TRAJECTORY TERMINATION


        ***  THIS CASE TOOK       .483  SECONDS TO INTEGRATE A SPAN OF     71.1250  MINUTES  ***

            ***  FROM         811.021  TO        882.146  MINUTES FROM MIDNIGHT OF EPOCH  ***

ENTER SEGMENT 81 AT      3.9 SECONDS.  EXECUTION TIME FOR SEGMENT 10 WAS       .5 CP SECS.

ENTER SEGMENT 82 AT      3.9 SECONDS.  EXECUTION TIME FOR SEGMENT 81 WAS       .1 CP SECS.
```

```
****************************************** STAGE 2 ************************************************

STAPASS   YEAR MO DY HR MN  SEC                 RESIDUALS - EXTERNAL UNITS                  MME


          SUMMARY OF PREDICTED STATISTICS
 STA  TYP        RMS         TYP        RMS         TYP        RMS         TYP        RMS


PREDICTED RESIDUAL RMS =  0.

ENTER SEGMENT 83 AT     3.9 SECONDS.  EXECUTION TIME FOR SEGMENT 82 WAS      .0 CP SECS.

ITERATION NUMBER     1
    0 MEASUREMENTS WERE USED IN THIS SOLUTION
CURRENT SOLUTION IS

NAME              CURRENT VALUE         CORRECTION      NEW VALUE             TOTAL CORR.     SIGMA
6820     X         .21462602415330E+08 -0.               .21462602415330E+08  0.              .29859908E+03
6820     Y         .20600020544027E+07 -0.               .20600020544027E+07  0.              .53540718E+03
6820     Z         .58324941054139E+03 -0.               .58324941054139E+03  0.              .13559432E+04
6820     DX        .12627637289684E+04 -0.               .12627637289684E+04  0.              .19112453E+01
6820     DY       -.82148716253522E+04 -0.              -.82148716253522E+04  0.              .42129759E+00
6820     DZ       -.24308352500073E+05 -0.              -.24308352500073E+05  0.              .34901961E+00
6820     DRAG      .92174626938252E-02 -0.               .92174626938252E-02  0.              .58941494E-03

NAME              SIGMA ZERO      SIGMA DEWT      TOTAL CORR.     T.C./SIGMAO     T.C./SIGMAD
6820     X         .23598189E+03   .29859908E+03  0.              0.              0.
6820     Y         .46615033E+03   .53540718E+03  0.              0.              0.
6820     Z         .12161926E+04   .13559432E+04  0.              0.              0.
6820     DX        .18021846E+01   .19112453E+01  0.              0.              0.
6820     DY        .36169763E+00   .42129759E+00  0.              0.              0.
6820     DZ        .27691647E+00   .34901961E+00  0.              0.              0.
6820     DRAG      .51866171E-03   .58941494E-03  0.              0.              0.

RESIDUAL  RMS =    0.
RESIDUAL  SOS =    0.
APRIORI   RMS =    0.
APRIORI   SOS =    0.
TOTAL     SOS =    0.
PREDICTED SOS =    0.
```

****** LEAST SQUARES PROCESS CONVERGED ******

ATA

	6820 X	6820 Y	6820 Z	6820 DX	6820 DY	6820 DZ	6820 DRAG	
6820 X	.16114E-02							
6820 Y	.16088E-03	.36029E-04						
6820 Z	.87962E-05	.51395E-06	.14740E-04					
6820 DX	.32316E-02	-.35608E-02	-.10851E-01	.96554E+01				
6820 DY	-.43220E+00	-.51557E-01	-.97442E-04	-.20794E+01	.12850E+03			
6820 DZ	-.12583E+01	-.12158E+00	-.33604E-02	-.73308E+01	.33698E+03	.99553E+03		
6820 DRAG	.93853E+02	.89820E+01	-.27226E+01	.18668E+04	-.25541E+05	-.75004E+05	.10104E+08	
ATB	-0.	-0.	-0.	-0.	-0.	-0.	-0.	0.

ATA INVERSE

	6820 X	6820 Y	6820 Z	6820 DX	6820 DY	6820 DZ	6820 DRAG
6820 X	.89161E+05						
6820 Y	.64041E+05	.28666E+06					
6820 Z	.19587E+06	.60989E+06	.18386E+07				
6820 DX	.31122E+03	.87371E+03	.25379E+04	.36529E+01			
6820 DY	.61616E+02	.16430E+03	.31659E+03	.47678E+00	.17749E+00		
6820 DZ	.99219E+02	.57766E+02	.20549E+03	.32496E+00	.36601E-01	.12181E+00	
6820 DRAG	-.45064E-01	-.15666E+00	-.45517E+00	-.66094E-03	-.77576E-04	-.30061E-04	.34741E-06

CORRELATION MATRIX

6820 X	1.00000						
6820 Y	.40058	1.00000					
6820 Z	.46377	.84009	1.00000				
6820 DX	.54534	.85871	.97929	1.00000			
6820 DY	.48980	.72839	.55419	.59212	1.00000		
6820 DZ	.95204	.30538	.43422	.48716	.24891	1.00000	
6820 DRAG	-.25605	-.49643	-.56953	-.58671	-.31241	-.14613	1.00000

ENTER SEGMENT 84 AT 4.0 SECONDS. EXECUTION TIME FOR SEGMENT 83 WAS .0 CP SECS.

ATA INVERSE UPDATED TO 879.00 MINUTES FROM MIDNIGHT OF EPOCH

	6820 X	6820 Y	6820 Z	6820 DX	6820 DY	6820 DZ	6820 DRAG
6820 X	.95809E+07						
6820 Y	.10097E+07	.18607E+06					
6820 Z	.13755E+06	.15107E+05	.88340E+05				
6820 DX	-.71989E+02	-.32306E+02	-.95064E+02	.11142E+00			
6820 DY	-.37018E+04	-.44852E+03	-.62902E+02	.49529E-01	.15454E+01		
6820 DZ	-.10880E+05	-.11553E+04	-.20265E+03	.13719E+00	.42122E+01	.12469E+02	
6820 DRAG	.13151E+01	.13110E+00	-.41728E-02	.10330E-04	-.49906E-03	-.14747E-02	.34741E-06

G AND G DEWEIGHTING MATRICES FOR VEHICLE 6820

ORBIT PLANE COORDINATE SYSTEM

.26229E+05					
-.79673E+04	.38750E+06				
0.	0.	.24916E+05			
.15384E+02	-.37074E+03	0.	.37047E+00		
-.30689E+02	.93222E+01	0.	-.18000E-01	.35908E-01	
0.	0.	.57586E+01	0.	0.	.31734E-01

PARAMETER SET COORDINATE SYSTEM

.87797E-09					
.77093E-10	.64413E-10				
-.10427E-10	-.10049E-12	.59356E-10			
.34815E-11	-.11055E-11	-.39878E-11	.31126E-12		
-.16180E-10	-.84678E-12	-.13394E-12	-.79310E-13	.53885E-12	
-.47865E-10	-.44451E-11	.15397E-11	-.24524E-12	.83169E-12	.27518E-11

**** ORBITAL ELEMENTS FOR VEHICLE 1 FOR NEXT DATA STAGE ****

YEAR/MO/DY	X	ALPHA	A	AF	MEAN ANOMALY	APOGEE RADIUS
HR/MIN	Y	DELTA	E	AG	ECCENTRIC ANOM	APOGEE HEIGHT
SECONDS	Z	BETA	I	N	TRUE ANOMALY	PERIGEE RADIUS
LATITUDE	XDOT	AZIMUTH	O	L	KEPLERIAN PER	PERIGEE HEIGHT
LONGITUDE	YDOT	RADIUS	U	CHI	ANOMALY PER	O-DOT
HEIGHT	ZDOT	VELOCITY	TAU	PSI	NODAL PERIOD	U-DOT
1970/ 6/26	-861872.839	97.158392672	21737616.110	.0115440762591	330.12378221	3647.59745
14/39	6862499.928	71.116801417	.01957929700	-.0158140182847	329.5553541 5	211.36878
0.0003000	21220527.828	90.568518390	108.876805463	.0670736009855	328.9820 3717	3507.50556
71.2343408	25757.4037672	271.463539434	185.611644975	276.252855068	89.4539728	71.27589
323.1034043	2520.8380076	21370691.979	120.517427874	-.13677847464	89.6928160	2.8239257459
83.5838	-29.3564957	25880.4813975	796.9697671	-1.39206148348	89.7249242	-2.0800888599

LEAST SQUARES PROCESS CONVERGED.

EXIT SEGMENT 84 AT 4.0 SECONDS. EXECUTION TIME FOR SEGMENT 84 WAS .0 CP SECS.

```
ENTER SEGMENT 10 AT     4.0 SECONDS.  EXECUTION TIME FOR SEGMENT 84 WAS      .1 CP SECS.

********************************** TRAJECTORY INTEGRATION FOR CASE   1  **********************************

                                   * PREDETERMINED EVENT TABLE *
 TIME(MME)    TYPE       ASSOCIATED QUANTITIES
   879.0000 TZERO
   903.7449 TSTOP

       ***  TRAJECTORY START

       * * * * * * * * * * * * * * * * * * * *   ECI  * * * * * * * * * * * * * * * * * * * *
SEG11 ENTRY TIME IS    4.04300
*               STEP   DOUBLED          T  =   882.250000    H  =      .250000    NSTEP  =       25
*               STEP   DOUBLED          T  =   889.250000    H  =      .500000    NSTEP  =       52
  NODE  T =     .900745999138E+03    .214559397444E+08    .212517332371E+07    -.122432195041E-04
       DT =     .500000000000E+00    .128685767449E+04   -.821173714214E+04    -.243076958233E+05

       ***  TRAJECTORY TERMINATION

       ***  THIS CASE TOOK      .253  SECONDS TO INTEGRATE A SPAN OF     24.7500  MINUTES  ***

           ***  FROM        879.000  TO        903.750  MINUTES FROM MIDNIGHT OF EPOCH  ***

ENTER SEGMENT 81 AT     4.3 SECONDS.  EXECUTION TIME FOR SEGMENT 10 WAS      .3 CP SECS.

ENTER SEGMENT 82 AT     4.4 SECONDS.  EXECUTION TIME FOR SEGMENT 81 WAS      .1 CP SECS.
```

** STAGE 3 **

STA	PASS	YEAR MO DY HR MN SEC	RESIDUALS - EXTERNAL UNITS			MME
393	16	1970 6 26 14 39 20.0000	0.	.137560E+00 AZ	-.207868E-01 EL	879.333
		PREDICTED RESIDUALS	0.	0.	0.	
393	16	1970 6 26 14 39 19.2503	.116394E+02 SRR	0.	0.	879.321
		PREDICTED RESIDUALS	.139249E+02	0.	0.	
393	16	1970 6 26 14 39 36.0000	0.	.134860E+00 AZ	.422514E-02 EL	879.600
		PREDICTED RESIDUALS	0.	0.	0.	
393	16	1970 6 26 14 39 35.2492	.144143E+02 SRR	0.	0.	879.587
		PREDICTED RESIDUALS	.174253E+02	0.	0.	
393	16	1970 6 26 14 40 28.0000	-.568419E+03 RNG	.140222E+00 AZ	-.975779E-02 EL	880.467
		PREDICTED RESIDUALS	.563792E+03	0.	0.	
393	16	1970 6 26 14 40 27.2438	.236238E+02 SRR	0.	0.	880.454
		PREDICTED RESIDUALS	.294388E+02	0.	0.	
393	16	1970 6 26 14 41 12.0000	.487147E+03 RNG	.142777E+00 AZ	.214578E-01 EL	881.200
		PREDICTED RESIDUALS	.888521E+03	0.	0.	
393	16	1970 6 26 14 41 11.2384	.218359E+02 SRR	0.	0.	881.187
		PREDICTED RESIDUALS	.276626E+02	0.	0.	
393	16	1970 6 26 14 41 24.0000	.741683E+03 RNG	.118419E+00 AZ	.221082E-01 EL	881.400
		PREDICTED RESIDUALS	.118599E+04	0.	0.	
393	16	1970 6 26 14 41 23.2371	.194904E+02 SRR	0.	0.	881.387
		PREDICTED RESIDUALS	.248938E+02	0.	0.	
313	16	1970 6 26 14 51 12.0000	-.118038E+04 RNG	-.376398E-02 AZ	.173580E-01 EL	891.200
		PREDICTED RESIDUALS	.252318E+04	0.	0.	
313	16	1970 6 26 14 51 11.2533	.891136E+01 SRR	0.	0.	891.188
		PREDICTED RESIDUALS	.151941E+02	0.	0.	
313	16	1970 6 26 14 51 44.0000	-.580432E+03 RNG	.445570E-01 AZ	.362221E-01 EL	891.733
		PREDICTED RESIDUALS	.143692E+04	0.	0.	
313	16	1970 6 26 14 51 43.2484	.323296E+02 SRR	0.	0.	891.721
		PREDICTED RESIDUALS	.622789E+02	0.	0.	
313	16	1970 6 26 14 52 40.0000	.119407E+04 RNG	.765811E-02 AZ	-.827994E-03 EL	892.667
		PREDICTED RESIDUALS	.238760E+04	0.	0.	
313	16	1970 6 26 14 52 39.2320	.106648E+02 SRR	0.	0.	892.654
		PREDICTED RESIDUALS	.255109E+02	0.	0.	
313	16	1970 6 26 14 53 4.0000	.133058E+04 RNG	-.356187E-02 AZ	-.622461E-02 EL	893.067
		PREDICTED RESIDUALS	.274215E+04	0.	0.	
313	16	1970 6 26 14 53 3.2305	.299246E+01 SRR	0.	0.	893.054
		PREDICTED RESIDUALS	.901653E+01	0.	0.	
313	16	1970 6 26 14 54 4.0000	.137674E+04 RNG	-.296810E-01 AZ	-.967884E-02 EL	894.067
		PREDICTED RESIDUALS	.295458E+04	0.	0.	
313	16	1970 6 26 14 54 3.2296	-.186451E+00 SRR	0.	0.	894.054
		PREDICTED RESIDUALS	.154078E+01	0.	0.	

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ITEM	DESCRIPTION	REFERENCE SECTION
13	Residuals - External Units. Each line corresponds to one input observation set or card and contains the station-pass identification in year, month, day, hour, minute, and second; three pairs of measurement residuals and identification; and the time in MME	

The residuals are the unnormalized differences between the input measurements (modified by bias and/or refraction corrections) and the corresponding values for the same measured types computed from the integrated trajectory position at the observation time. The observation names are abbreviated as follows:

RNG	Range	CM3	Three-way cumulative doppler
AZ	Aximuth	DOP	Doppler
EL	Elevation	TWD	Two-way doppler
TRA	Topocentric right	SRR	SGLS range rate
	ascension	AX	X-antenna
TD	Topocentric declination	AY	Y-antenna
THA	Topocentric hour angle	CC3	JPL two- or three-way doppler
GRA	Geocentric right ascension	TNT	Tranet doppler
GD	Geocentric declination	GCR	Geoceiver range difference
U	u	V2	Vehicle-vehicle range
V	v	V2D	Vehicle-vehicle range rate
H	Height	S2	Station-vehicle-vehicle range
X		S2D	Station-vehicle-vehicle range rate
Y		S3	Station-vehicle-vehicle-vehicle range
Z		S3D	Station-vehicle-vehicle-vehicle range rate
P	P	V3	Vehicle-vehicle-vehicle range
Q	Q	TDA	Time differences of arrival
RD	Range rate	TØA	Time of arrival
PD	P rate	N	Time-of-arrival counter
QD	Q rate	ACC	Accelerometer
CM1	One-way cumulative doppler		

Predicted residuals for each observation ($\emptyset$) = $\underline{r} \cdot ([C_0]\underline{r})$ where C_0 = reweighted initial covariance matrix $(A^T A)^{-1}$ for this iteration

$$\underline{r} = \frac{\partial \emptyset}{\partial \underline{P}}$$

$\underline{P}$ = parameter set

SUMMARY OF PREDICTED STATISTICS

STA	TYP	RMS	TYP	RMS	TYP	RMS	TYP	RMS
313	RNG	.246498E+04	SRR	.311255E+02				
393	SRR	.234482E+02	RNG	.915407E+03				

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PREDICTED RESIDUAL RMS = .2162231161E+03 15

ENTER SEGMENT 83 AT 4.5 SECONDS. EXECUTION TIME FOR SEGMENT 82 WAS .1 CP SECS.

ITERATION NUMBER 1
18 MEASUREMENTS WERE USED IN THIS SOLUTION
CURRENT SOLUTION IS

NAME		CURRENT VALUE	CORRECTION	NEW VALUE	TOTAL CORR.	SIGMA
6820	X	-.861872839246 46E+06	.26946076E+04	-.85917823167636E+06	.26946076E+04	.86664237E+01
6820	Y	.68624999275575E+07	.15963546E+03	.68626595639133E+07	.15963546E+03	.12336910E+02
6820	Z	.20220527827524E+08	.85484888E+03	.20221382676408E+08	.85484888E+03	.38966545E+02
6820	DX	.25757403767231E+05	-.87170446E+00	.25756532062771E+05	-.87170446E+00	.41930156E-01
6820	DY	.25208380376158E+04	-.10258623E+01	.25198121452701E+04	-.10258623E+01	.41057022E-01
6820	DZ	-.29056495734126E+02	-.31997651E+01	-.32256260839496E+02	-.31997651E+01	.85279079E-01
6820	DRAG	.92174626938252E-02	.24751907E-03	.94649817679362E-02	.24751907E-03	.41172570E-03

NAME		SIGMA ZERO	SIGMA DENT	TOTAL CORR.	T.C./SIGMAO	T.C./SIGMAD
6820	X	.30953062E+04	.31567975E+04	.26946076E+04	.87054636E+00	.85358898E+00
6820	Y	.43136182E+03	.46290205E+03	.15963546E+03	.37007322E+00	.34485796E+00
6820	Z	.29722091E+03	.33812934E+03	.85484888E+03	.28761339E+01	.25281713E+01
6820	DX	.33379981E+00	.38637129E+00	-.87170446E+00	-.26114389E+01	-.22561316E+01
6820	DY	.12431271E+01	.12692153E+01	-.10258623E+01	-.82522727E+00	-.80826505E+00
6820	DZ	.35311126E+01	.35782622E+01	-.31997651E+01	-.90614546E+00	-.89422321E+00
6820	DRAG	.58941494E-03	.58941494E-03	.24751907E-03	.41994028E+00	.41994028E+00

RESIDUAL RMS = .1334096648E+03
RESIDUAL SDS = .3203664959E+06
APRIORI RMS = 0.
APRIORI SOS = 0.
TOTAL SOS = .3203664959E+06
PREDICTED SDS = .1510687690E+02

ITEM	DESCRIPTION	REFERENCE SECTION
14	Summary of predicted statistics contains the station data type and the RMS value for each data type	Item 9
15	Predicted residual RMS is the resulting RMS value calculated from the RMS values of each data type	Item 14

ATA

	6820 X	6820 Y	6820 Z	6820 DX	6820 DY	6820 DZ	6820 DRAG	
6820 X	.46287E-01							
6820 Y	.12552E-01	.35232E-01						
6820 Z	-.10536E-01	.28025E-01	.67521E-01					
6820 DX	.19273E+02	.37392E+01	-.16916E+02	.20191E+05				
6820 DY	.16079E+02	.20377E+02	.15566E+02	.90214E+04	.17560E+05			
6820 DZ	-.76409E+01	.13403E+02	.37019E+02	-.13102E+05	.61963E+04	.21591E+05		
6820 DRAG	-.42191E+03	.16306E+03	.99403E+03	-.44431E+06	-.57531E+05	.56580E+06	.29194E+08	
ATE	.10877E+03	-.36056E+01	-.85625E+02	.53025E+05	.14167E+05	-.50686E+05	-.16180E+07	.32037E+06

ATA INVERSE

	6820 X	6820 Y	6820 Z	6820 DX	6820 DY	6820 DZ	6820 DRAG
6820 X	.75107E+02						
6820 Y	.50115E+01	.15220E+03					
6820 Z	.20719E+03	-.83866E+02	.15184E+04				
6820 DX	-.11061E+00	.25883E+00	-.10674E+01	.17581E-02			
6820 DY	-.84013E-01	-.37172E+00	.16065E+00	-.12867E-02	.16857E-02		
6820 DZ	-.34376E+00	.35833E+00	-.30283E+01	.31680E-02	-.16098E-02	.72725E-02	
6820 DRAG	-.11839E-02	-.16602E-02	-.54738E-02	-.38768E-05	.10326E-04	.23858E-06	.16952E-06

CORRELATION MATRIX

6820 X	1.00000						
6820 Y	.04687	1.00000					
6820 Z	.61354	-.17446	1.00000				
6820 DX	-.30438	.50037	-.65329	1.00000			
6820 DY	-.23611	-.73386	.10041	-.74742	1.00000		
6820 DZ	-.46512	.34059	-.91132	.88597	-.45970	1.00000	
6820 DRAG	-.33180	-.32684	-.34118	-.22456	.61085	.00679	1.00000

ENTER SEGMENT 84 AT 435 SECONDS. EXECUTION TIME FOR SEGMENT 83 WAS .0 CP SECS.

**** ORBITAL ELEMENTS FOR VEHICLE 1 FOR ITERATION 2. ****

YEAR/MO/DY	X	ALPHA	A	AF	MEAN ANOMALY	APOGEE RADIUS
HR/MIN	Y	DELTA	E	AG	ECCENTRIC ANOM	APOGEE HEIGHT
SECONDS	Z	BETA	I	N	TRUE ANOMALY	PERIGEE RADIUS
LATITUDE	XDOT	AZIMUTH	O	L	KEPLERIAN PER	PERIGEE HEIGHT
LONGITUDE	YDOT	RADIUS	U	CHI	ANOMALY PER	O-DOT
HEIGHT	ZDOT	VELOCITY	TAU	PSI	NODAL PERIOD	U-DOT
1970/ 6/26	-859178.232	97.136379080	21737496.946	.0115444785030	339.05894482	3647.45825
14/39	6862659.563	71.117991789	.01954597749	-.0157724523242	329.49038975	211.21826
0.0000000	20221382.676	90.568645043	108.875801391	.0670741516302	328.91695641	3507.60554
71.2355249	25756.5320628	271.442104951	185.611994202	276.269899869	89.4532373	71.36555
323.0810907	2519.8121453	21371443.584	120.589870828	-.13678442616	89.5929573	2.8238278269
83.7077	-32.2562608	25879.5177238	796.9865525	-1.39203486846	89.7241692	-2.0803574733

```
                              TOTAL EDIT SUMMARY

 STA      N TYP   RMS     RMS/SIG     MEAN       N TYP   RMS     RMS/SIG      MEAN       N TYP   RMS     RMS/SIG      MEAN
 313      5 RNG 1.2E+03 5.8E+01     4.3E+02      5 AZ  2.4E-02 0.           3.9E-03      5 EL  1.9E-02 0.           7.4E-03
 313      5 SRR 1.6E+01 1.6E+02     1.1E+01
 393      5 AZ  1.4E-01 0.          1.3E-01      5 EL  1.7E-02 0.           3.4E-03      5 SRR 1.9E+01 1.9E+02    1.8E+01
 393      3 RNG 6.1E+02 3.0E+01     2.2E+02                                                                                  (18)

EXIT SEGMENT 84 AT       4.5 SECONDS.  EXECUTION TIME FOR SEGMENT 84 WAS       .0 CP SECS.
ENTER SEGMENT 10 AT      4.5 SECONDS.  EXECUTION TIME FOR SEGMENT 84 WAS       .1 CP SECS.

 *********************************** TRAJECTORY INTEGRATION FOR CASE   1 ***********************************

                                      * PREDETERMINED EVENT TABLE *
 TIME(MME)     TYPE        ASSOCIATED QUANTITIES
    879.0000 TZERO
    903.7449 TSTOP

       ***  TRAJECTORY START

       * * * * * * * * * * * * * * * * * * * *  ECI  * * * * * * * * * * * * * * * * * * * *
SEG11 ENTRY TIME IS     4.5710
 *               STEP    DOUBLED         T  =     882.250000      H  =       .250000      NSTEP  =       25
 *               STEP    DOUBLED         T  =     889.250000      H  =       .500000      NSTEP  =       52
   NODE  T =      .903745091723E+03    .214557299934E+08    .212528979968E+07    -.144713230605E-04
         OT =     .500000000 00E+00    .128581880605E+04    -.821146697778E+04   -.243080029595E+05

       ***  TRAJECTORY TERMINATION


       ***  THIS CASE TOOK        .253  SECONDS TO INTEGRATE A SPAN OF     24.7500  MINUTES  ***

            ***  FROM          879.000  TO        903.750  MINUTES FROM MIDNIGHT OF EPOCH  ***

ENTER SEGMENT 81 AT      4.8 SECONDS.  EXECUTION TIME FOR SEGMENT 10 WAS       .3 CP SECS.

ENTER SEGMENT 82 AT      4.9 SECONDS.  EXECUTION TIME FOR SEGMENT 21 WAS       .1 CP SECS.
```

ITEM	DESCRIPTION	REFERENCE SECTION
16	<u>Total edit summary</u> is fully explained in Case B, Item 7.	2.2.4

```
****************************************************  STAGE  3  ****************************************************

STAPASS    YEAR MO DY HR MN  SEC                    RESIDUALS - EXTERNAL UNITS                           MME

393  16   1970  6 26 14 39 20.0000  0.                  .107148E+00 AZ   -.398319E-01 EL    879.333
393  16   1970  6 26 14 39 19.2503  -.442553E-01 SRR  0.                 0.                 879.321
393  16   1970  6 26 14 39 36.0000  0.                  .989787E-01 AZ   -.158302E-01 EL    879.600
393  16   1970  6 26 14 39 35.2492   .305583E-01 SRR  0.                 0.                 879.587
393  16   1970  6 26 14 40 28.0000  -.146891E+02 RNG   .869654E-01 AZ   -.289018E-01 EL    880.467
393  16   1970  6 26 14 40 27.2438   .230042E-01 SRR  0.                 0.                 880.454
393  16   1970  6 26 14 41 12.0000  -.416428E+01 RNG   .904593E-01 AZ    .832230E-02 EL    881.200
393  16   1970  6 26 14 41 11.2384   .170665E-03 SRR  0.                 0.                 881.187
393  16   1970  6 26 14 41 24.0000   .352911E+01 RNG   .694075E-01 AZ    .106563E-01 EL    881.400
393  16   1970  6 26 14 41 23.2371  -.390290E-01 SRR  0.                 0.                 881.387
313  16   1970  6 26 14 51 12.0000   .222335E+02 RNG  -.291823E-01 AZ   -.133159E-01 EL    891.200
313  16   1970  6 26 14 51 11.2533  -.659466E-01 SRR  0.                 0.                 891.188
313  16   1970  6 26 14 51 44.0000   .246368E+02 RNG  -.382235E-01 AZ   -.974428E-02 EL    891.733
313  16   1970  6 26 14 51 43.2484   .368395E-01 SRR  0.                 0.                 891.721
313  16   1970  6 26 14 52 40.0000  -.189811E+02 RNG  -.334623E-01 AZ    .663150E-02 EL    892.667
313  16   1970  6 26 14 52 39.2320   .977509E-01 SRR  0.                 0.                 892.654
313  16   1970  6 26 14 53  4.0000  -.201657E+02 RNG  -.229135E-01 AZ   -.254060E-02 EL    893.067
313  16   1970  6 26 14 53  3.2365   .104250E-01 SRR  0.                 0.                 893.054
313  16   1970  6 26 14 54  4.0000  -.184706E+02 RNG  -.349994E-01 AZ   -.837636E-02 EL    894.067
313  16   1970  6 26 14 54  3.2296  -.538472E-03 SRR  0.                 0.                 894.054

ENTER SEGMENT 83 AT      5.0 SECONDS.  EXECUTION TIME FOR SEGMENT 82 WAS      .1 CP SECS.

ITERATION NUMBER     2
   18 MEASUREMENTS WERE USED IN THIS SOLUTION
CURRENT SOLUTION IS

NAME             CURRENT VALUE          CORRECTION       NEW VALUE               TOTAL CORR.       SIGMA
6820   X         -.85917823167636E+06    .35999910E+00   -.85917787167725E+06     .26949676E+04    .86647990E+01
6820   Y          .68626595630133E+07   -.15450372E+01    .68626580179761E+07     .15809042E+03    .12332311E+02
6820   Z          .20221382676408E+08    .87685625E+00    .20221383553264E+08     .85572574E+03    .38971069E+02
6820   DX         .25756532362771E+05    .40341242E-03    .25756532466183E+05    -.87139105E+00    .41930178E-01
6820   DY         .25198121452761E+04   -.33434910E-02    .25198088017790E+04    -.10292058E+01    .41030290E-01
6820   DZ        -.32256260830496E+02    .18162331E-02   -.32254444597435E+02    -.31979489E+01    .85289056E-01
6820   DRAG       .94649817670862E-02   -.40685814E-05    .94609131856769E-02     .24343049E-03    .41173917E-03
```

NAME		SIGMA ZERO	SIGMA LEWT	TOTAL CORR.	T.C./SIGMAO	T.C./SIGMAD
6820	X	.30953062E+04	.31567975E+04	.26949676E+04	.87066266E+00	.85370302E+00
6820	Y	.43136182E+03	.46290205E+03	.15809042E+03	.36649145E+00	.34152024E+00
6820	Z	.2972209 E+03	.33812934E+03	.85572574E+03	.28790901E+01	.25307645E+01
6820	DX	.3337998 E+00	.38637129E+00	-.87130105E+00	-.26102503E+01	-.22550875E+01
6820	DY	.12431271E+01	.12692153E+01	-.10292058E+01	-.82791685E+00	-.81089935E+00
6820	DZ	.35311826E+01	.35702622E+01	-.31979489E+01	-.90563112E+00	-.89571563E+00
6820	DRAG	.58941494E-03	.58941494E-03	.24345049E-03	.41303753E+00	.41303753E+00

RESIDUAL	RMS =	.6734028811E+00
RESIDUAL	SOS =	.8162485924E+01
APRIORI	RMS =	.9997736082E+00
APRIORI	SOS =	.6996788883E+01
TOTAL	SOS =	.1515927481E+02
PREDICTED	SOS =	.1487141259E+02

ATA

	6820 X	6820 Y	6820 Z	6820 DX	6820 DY	6820 DZ	6820 DRAG	
6820 X	.46320E-01							
6820 Y	.12528E-01	.35183E-01						
6820 Z	-.10610E-01	.27983E-01	.67555E-01					
6820 DX	.19313E+02	.37246E+01	-.16989E+02	.20240E+05				
6820 DY	.16069E+02	.20327E+02	.15509E+02	.90207E+04	.17517E+05			
6820 DZ	-.76831E+01	.13387E+02	.37054E+02	-.13147E+05	.61794E+04	.21619E+05		
6820 DRAG	-.41838E+03	.16168E+03	.98556E+03	-.43967E+06	-.57035E+05	.56051E+06	.28814E+08	
ATB	-.70171E-01	-.68118E-01	.16760E-01	-.57784E+02	-.55513E+02	.29092E+02	.13779E+04	.81625E+01

ATA INVERSE

	6820 X	6820 Y	6820 Z	6820 DX	6820 DY	6820 DZ	6820 DRAG
6820 X	.75079E+02						
6820 Y	.48999E+01	.15209E+03					
6820 Z	.20715E+03	-.84416E+02	.15187E+04				
6820 DX	-.11670E+00	.25894E+00	-.10677E+01	.17581E-02			
6820 DY	-.83529E-01	-.37126E+00	.16293E+00	-.12873E-02	.16835E-02		
6820 DZ	-.34426E+00	.35854E+00	-.30310E+01	.31672E-02	-.16091E-02	.72742E-02	
6820 DRAG	-.11803E-02	-.16532E-02	-.54754E-02	-.38724E-05	.10289E-04	.30184E-06	.16953E-06

```
CORRELATION MATRIX
6820 X      1.00000
6820 Y       .04585 1.00000
6820 Z       .61344 -.17565 1.00000
6820 DX     -.30470  .50075 -.65340 1.00000
6820 DY     -.23495 -.73372  .10189 -.74823 1.00000
6820 DZ     -.46584  .34088 -.91189  .88565 -.45982 1.00000
6820 DRAG   -.33084 -.32558 -.34123 -.22430  .60903  .00866 1.00000

ENTER SEGMENT 84 AT      5.0 SECONDS.  EXECUTION TIME FOR SEGMENT 83 WAS      .0 CP SECS.
**** ORBITAL ELEMENTS FOR VEHICLE    1 FOR ITERATION   3. ****

 YEAR/MO/DY           X          ALPHA            A               AF      MEAN ANOMALY   APOGEE RADIUS
     HR/MIN           Y          DELTA            E               AG     ECCENTRC ANOM   APOGEE HEIGHT
    SECONDS           Z           BETA            I                N      TRUE ANOMALY  PERIGEE RADIUS
   LATITUDE        XDOT        AZIMUTH            O                L     KEPLERIAN PER  PERIGEE HEIGHT
  LONGITUDE        YDOT         RADIUS            U              CHI      ANOMALY PER            O-DOT
     HEIGHT        ZDOT       VELOCITY           TAU             PSI      NODAL PERIOD            U-DOT

 1970/ 6/26    -859177.872   97.136077710   21737497.734  .0115444430051    330.05906030     3647.45839
   14/39       6862658.018   71.117996552   .01954597823 -.0157724792175    329.49050718      211.21842
 0.0000000    20221383.553   90.568643087  108.875796568  .0670741479820    328.91777581     3587.60066
 71.2355296   25756.5324662  271.442112057  185.611985367  276.260794805     89.4532421       71.36069
323.0810893   2519.8088018   21371443.903   120.589749135  -.13673419932    89.6920622    2.8238267035
  83.7077     -32.2544446    25879.5177974   796.9865193  -1.39203476573    89.7241741   -2.0803583339

EXIT SEGMENT 84 AT      5.0 SECONDS.  EXECUTION TIME FOR SEGMENT 84 WAS      .0 CP SECS.
```

```
ENTER SEGMENT 10 AT      5.0 SECONDS.  EXECUTION TIME FOR SEGMENT 84 WAS      .0 CP SECS.

 ********************************* TRAJECTORY INTEGRATION FOR CASE   1  *********************************

                                           * PREDETERMINED EVENT TABLF *
 TIME(MME)    TYPE       ASSOCIATED QUANTITIES
    879.0000 TZERO
    903.7449 TSTOP

        ***  TRAJECTORY START

        * * * * * * * * * * * * * * * * * * * *    ECI  * * * * * * * * * * * * * * * * * * * *
SEG11 ENTRY TIME IS     5.07730
 *              STEP   DOUBLED        T  =    882.250000     H  =       .250000     NSTEP  =        25
 *              STEP   DOUBLED        T  =    889.250000     H  =       .500000     NSTEP  =        52
   NODE  T =      .900745093793E+03    .214557320665E+08    .212527764462E+07    -.729249300990E-05
           DT =    .000000000000E+00    .128583828185E+04   -.821146372638E+04    -.243980023908E+05

        ***  TRAJECTORY TERMINATION

        ***  THIS CASE TOCK       .255  SECONDS TO INTEGRATE A SPAN OF     24.7500  MINUTES  ***

            ***  FROM         879.000  TO        903.750  MINUTES FROM MIDNIGHT OF EPOCH  ***

ENTER SEGMENT 81 AT      5.3 SECONDS.  EXECUTION TIME FOR SEGMENT 10 WAS      .3 CP SECS.

ENTER SEGMENT 82 AT      5.4 SECONDS.  EXECUTION TIME FOR SEGMENT 81 WAS      .1 CP SECS.
```

** STAGE 3 **

STA	PASS	YEAR	MO	DY	HR	MN	SEC	RESIDUALS - EXTERNAL UNITS			MME
393	16	1970	6	26	14	39	20.0000	0.	.107165E+00 AZ	-.398429E-01 EL	879.333
393	16	1970	6	26	14	39	19.2503	-.362891E-01 SRR	0.	0.	879.321
393	16	1970	6	26	14	39	36.0000	0.	.989952E-01 AZ	-.158431E-01 EL	879.600
393	16	1970	6	26	14	39	35.2492	.388371E-01 SRR	0.	0.	879.587
393	16	1970	6	26	14	40	28.0000	-.127559E+02 RNG	.869688E-01 AZ	-.289209E-01 EL	880.467
393	16	1970	6	26	14	40	27.2438	.275882E-01 SRR	0.	0.	880.454
393	16	1970	6	26	14	41	12.0000	-.221059E+01 RNG	.904432E-01 AZ	.830291E-02 EL	881.200
393	16	1970	6	26	14	41	11.2384	-.311691E-02 SRR	0.	0.	881.187
393	16	1970	6	26	14	41	24.0000	.543241E+01 RNG	.693073E-01 AZ	.106378E-01 EL	881.400
393	16	1970	6	26	14	41	23.2371	-.438627E-01 SRR	0.	0.	881.387
313	16	1970	6	26	14	51	12.0000	.231000E+02 RNG	-.290535E-01 AZ	-.133693E-01 EL	891.200
313	16	1970	6	26	14	51	11.2533	-.473738E-01 SRR	0.	0.	891.188
313	16	1970	6	26	14	51	44.0000	.264175E+02 RNG	-.380592E-01 AZ	-.988287E-02 EL	891.733
313	16	1970	6	26	14	51	43.2484	.734340E-01 SRR	0.	0.	891.721
313	16	1970	6	26	14	52	40.0000	-.170611E+02 RNG	-.335851E-01 AZ	.653932E-02 EL	892.667
313	16	1970	6	26	14	52	39.2320	.802365E-01 SRR	0.	0.	892.654
313	16	1970	6	26	14	53	4.0000	-.185782E+02 RNG	-.230127E-01 AZ	-.259586E-02 EL	893.067
313	16	1970	6	26	14	53	3.2305	-.338924E-03 SRR	0.	0.	893.054
313	16	1970	6	26	14	54	4.0000	-.171638E+02 RNG	-.350586E-01 AZ	-.840312E-02 EL	894.067
313	16	1970	6	26	14	54	3.2296	-.344210E-02 SRR	0.	0.	894.054

ENTER SEGMENT 83 AT 5.5 SECONDS. EXECUTION TIME FOR SEGMENT 82 WAS .1 CP SECS.

ITERATION NUMBER 3
18 MEASUREMENTS WERE USED IN THIS SOLUTION
CURRENT SOLUTION IS

NAME		CURRENT VALUE	CORRECTION	NEW VALUE	TOTAL CORR.	SIGMA
6820	X	-.859177871677725E+06	.47835554E-03	-.859177871199919E+06	.26949660E+04	.86647932E+01
6820	Y	.686265801797 61E+07	-.15530498E-03	.686265801782 07E+07	.15809026E+03	.12332326E+02
6820	Z	.202213835533264E+08	.37430598E-02	.202213835570 07E+08	.85572948E+03	.38971070E+02
6820	DX	.257565324661 83E+05	-.38323101E-05	.257565324623 51E+05	-.87131488E+00	.41930145E-01
6820	DY	.251980880177 90E+04	-.81119420E-07	.251980880169 79E+04	-.10292059E+01	.41030546E-01
6820	DZ	-.322544445974 35E+02	-.81730286E-05	-.322544527674 64E+02	-.31979570E+01	.85289692E-01
6820	DRAG	.946091318567 69E-02	-.55255057E-08	.946090766017 12E-02	.24344497E-03	.41173920E-03

NAME		SIGMA ZERO	SIGMA DEWT	TOTAL CORR.	T.C./SIGMA0	T.C./SIGMAD
6820	X	.30953062E+04	.31567975E+04	.26949680E+04	.87066282E+00	.85370317E+00
6820	Y	.43136182E+03	.46290205E+03	.15809026E+03	.36649199E+00	.34151991E+00
6820	Z	.29722090E+03	.33812934E+03	.85572948E+03	.28791027E+01	.25307756E+01
6820	DX	.33379980E+00	.38637129E+00	-.87130488E+00	-.26102618E+01	-.22550974E+01
6820	DY	.12431271E+01	.12692153E+01	-.10292059E+01	-.82791691E+00	-.81089941E+00
6820	DZ	.35311826E+01	.35782622E+01	-.31979570E+01	-.91563343E+00	-.89371791E+00
6820	DRAG	.58941494E-03	.58941494E-03	.24344497E-03	.41302816E+00	.41302816E+00

RESIDUAL RMS = .6607756855E+00
RESIDUAL SOS = .7859241119E+01
APRIORI RMS = .1003895035E+01
APRIORI SOS = .7012536101E+01
TOTAL SOS = .1487177722E+02
PREDICTED SOS = .1487177717E+02

****** LEAST SQUARES PROCESS CONVERGED ******

ATA

	6820 X	6820 Y	6820 Z	6820 DX	6820 DY	6820 DZ	6820 DRAG	
6820 X	.46320E-01							
6820 Y	.12528E-01	.35193E-01						
6820 Z	-.10609E-01	.27983E-01	.67555E-01					
6820 DX	.19313E+02	.37247E+01	-.16989E+02	.20240E+05				
6820 DY	.16069E+02	.20328E+02	.15509E+02	.90208E+04	.17517E+05			
6820 DZ	-.76830E+01	.13387E+02	.37054E+02	-.13147E+05	.61704E+04	.21619E+05		
6820 DRAG	-.41838E+03	.16167E+03	.98555E+03	-.43966E+06	-.57036E+05	.56050E+06	.28914E+08	
ATB	-.29748E-04	-.20918E-04	-.88262E-06	-.23391E-01	-.23512E-01	.30988E-02	.41490E+00	.78592E+01

ATA INVERSE

	6820 X	6820 Y	6820 Z	6820 DX	6820 DY	6820 DZ	6820 DRAG
6820 X	.75079E+02						
6820 Y	.49000E+01	.15209E+03					
6820 Z	.20715E+03	-.84417E+02	.15187E+04				
6820 DX	-.11070E+00	.25894E+00	-.10677E+01	.17581E-02			
6820 DY	-.83529E-01	-.37127E+00	.16293E+00	-.12873E-02	.10835E-02		
6820 DZ	-.34426E+00	.35854E+00	-.30310E+01	.31672E-02	-.16091E-02	.72742E-02	
6820 DRAG	-.11803E-02	-.16532E-02	-.54754E-02	-.38723E-05	.10289E-04	.30196E-06	.16953E-06

CORRELATION MATRIX

6820	X	1.00000						
6820	Y	.04586	1.00000					
6820	Z	.61344	-.17565	1.00000				
6820	DX	-.30469	.50075	-.65340	1.00000			
6820	DY	-.23495	-.73372	.1190	-.74823	1.00000		
6820	DZ	-.46594	.34085	-.1189	.88565	-.45982	1.00000	
6820	DRAG	-.33084	-.32558	-.34123	-.22430	.60902	.00860	1.00000

ENTER SEGMENT 84 AT 5.5 SECONDS. EXECUTION TIME FOR SEGMENT 83 WAS .0 CP SECS.

ATA INVERSE UPDATED TO 900.74 MINUTES FROM MIDNIGHT OF EPOCH

		6820 X	6820 Y	6820 Z	6820 DX	6820 DY	6820 DZ	6820 DRAG
6820	X	.75352E+04						
5820	Y	-.14908E+04	.48176E+03					
6820	Z	.60784E+04	-.14064E+04	.56034E+04				
6820	DX	.13201E+02	-.25698E+01	.10604E+02	.23166E-01			
6820	DY	.19277E+01	-.26673E+00	.15167E+01	.33877E-02	.65750E-03		
6820	DZ	.51825E+01	-.13525E+01	.52459E+01	.98051E-02	.12298E-02	.52821E-02	
6820	DRAG	-.23175E-01	.26550E-02	-.11955E-01	-.41516E-04	-.59657E-05	-.54047E-05	.16953E-06

G AND G DEWEIGHTING MATRICES FOR VEHICLE 6820

ORBIT PLANE COORDINATE SYSTEM

.78246E+04					
-.96415E+04	.13242E+05				
0.	0.	.74329E+04			
.17437E+02	-.20776E+02	0.	.41201E-01		
-.91552E+01	.11281E+02	0.	-.20402E-01	.10712E-01	
0.	0.	.58474E+01	0.	0.	.10176E-01

```
PARAMETER SET COORDINATE SYSTEM
      .16479E-1
      .69271E-11   .19750E-10
      .23336E-10   .61905E-11   .28857E-10
      .22445E-11   .13556E-11   .26535E-11   .32562E-12
      .54055E-12   .10236E-11   .49211E-12   .78111E-13   .97225E-13
      .11590E-11   .34357E-12   .14681E-11   .15783E-12   .16999E-13   .87612E-13
**** ORBITAL ELEMENTS FOR VEHICLE    1 FOR NEXT DATA STAGE ****

 YEAR/MO/DY             X          ALPHA              A                AF        MEAN ANOMALY    APOGEE RADIUS
     HR/MIN             Y          DELTA              E                AG        ECCENTRIC ANOM  APOGEE HEIGHT
    SECONDS             Z           BETA              I                 N        TRUE ANOMALY   PERIGEE RADIUS
   LATITUDE          XDOT        AZIMUTH              O                 L        KEPLERIAN PER  PERIGEE HEIGHT
  LONGITUDE          YDOT         RADIUS              U               CHI         ANOMALY PER            O-DOT
     HEIGHT          ZDOT       VELOCITY            TAU               PSI        NODAL PERIOD            U-DOT

 1970/ 6/26   21455717.114    5.657183506  21797285.075  .0122857499983   58.23076095        3663.69784
     15/ 0     2125373.124    .0007511100  .02127520963 -.0173693664702   59.32922068         227.60846
 44.6940000       282 643    88.951419980  138.848776959  .0667983727789   60.33349092        3511.04967
   .0067562   1286.1391971   198.848776950  185.656927094   3.5534913457    89.8225473          74.96429
226.1510867  -8211.4289637  21560728.370   119.615715412  -.1373173539045   89.6836302        2.7933472359
  104.5167  -24308.3023914  25699.7712610   886.2034378   -1.3912335620 9   89.7157996       -2.0669831941

LEAST SQUARES PROCESS CONVERGED.
                        TOTAL ECIT SUMMARY
```

STA	N TYP	RMS	RMS/SIG	MEAN	N TYP	RMS	RMS/SIG	MEAN	N TYP	RMS	RMS/SIG	MEAN
313	5 RNG	2.1E+01	1.0E+30	-6.6E-01	5 AZ	3.2E-02	0.	-3.2E-02	5 EL	8.9E-03	0.	-5.5E-03
313	5 SRR	5.3E-02	5.3E-01	2.1E-02								
393	5 AZ	9.1E-02	0.	9.1E-02	5 EL	2.4E-02	0.	-1.3E-02	5 SRR	3.3E-02	3.3E-01	-3.4E-03
393	3 RNG	8.1E+00	4.1E-01	-3.2E+00								

```
TYPE  SYMB  MINIMUM          CELTA           MEAN            MAXIMUM          STATION 313   PAGE  1
 RNG   0       -.42227890B+02   .83141500E+00  -.65713998E+00   .40913610E+02
 AZ    1       -.42250725E-01   .20993823E-03  -.31753014E-01  -.21256903E-01
 EL    2       -.19483211B- 1   .27881689E-03  -.55423665E-02   .83984781E-02
 SRR   3       -.77414398E-01   .19583505E-02   .23503126E-01   .11842065E+00
53472.*.........*.....3....*.2.......*.........*.........*..........*.1........*.........?*.........*..........*
53482.*                                                   *                                                    *
53492.*                                                   *                                                    *
53502.*                     1             2               *                            3     0                 *
53512.*                                                   *                                                    *
53522.*                                                   *                                                    *
53532.*                                                   *                                                    *
53542.*                                                   *                                                    *
53552.*                                                   *                                                    *
53562.*                               0           1       *                                3           2       *
53572.*                                                   *                                                    *
53582.*                             0           3         *          2                               1         *
53592.*                                                   *                                                    *
53602.*                                                   *                                                    *
53612.*                                                   *                                                    *
53622.*                                                   *                                                    *
53632.*                                                   *                                                    *
53642.*                               0   1    3 2        *                                                    *
       ****************************************** END OF PLOT *****************************************************
TYPE  SYMB  MINIMUM          CELTA           MEAN            MAXIMUM          STATION 393   PAGE  1
 AZ    0        .65166506E-01   .50850711E-03   .99591862E-01   .11601722E+00
 EL    1       -.53078909B-01   .79891344E-03  -.13133237E-01   .26812435E-01
 SRR   2       -.69479148B-01   .13222093E-02  -.33686846E-02   .62741779E-01
 RNG   3       -.18091632E+ 2   .29927194E+00  -.31780344E+01   .11735563E+02
52760.*.........*.......1.*....2....*.........*.........*..........*3.........*.........*..0......*..........*
52770.*                                                   *                                                    *
52780.*                                                1  *           3     0               2                  *
52790.*                                                   *                                                    *
52800.*                                                   *                                                    *
52810.*                                                   *                                                    *
52820.*                                                   *                                                    *
52830.*                   3           1              0    *                        2                           *
52840.*                                                   *                                                    *
52850.*                                                   *                                                    *
52860.*                                                   *                                                    *
52870.*                                                   2 3                         1                        *
52880.*        0          2                               *                             31                     *
       ****************************************** END OF PLOT *****************************************************
EXIT SEGMENT 84 AT      5.6 SECONDS.  EXECUTION TIME FOR SEGMENT 84 WAS      .1 CP SECS.
```

17

ITEM	DESCRIPTION	REFERENCE SECTION
17	An example of the printer plot of the measurement residuals for the last iteration (see Case B, Item 20, for a full explanation)	2.2.1 11.1.2 15

```
ENTER SEGMENT 10 AT      5.6 SECONDS.  EXECUTION TIME FOR SEGMENT 84 WAS       .1 CP SECS.

***********************************  TRAJECTORY INTEGRATION FOR CASE    1  ***********************************

                                   * PREDETERMINED EVENT TABLE *
 TIME(MME)     TYPE         ASSOCIATED QUANTITIES
   879.0000 TZERO
  1621.2182 TSTOP

        ***   TRAJECTORY START

        * * * * * * * * * * * * * * * * * * * * * * * *   ECI  * * * * * * * * * * * * * * * * * * * * * * * * *
SEG11 ENTRY TIME IS      5.64200
 *               STEP    DOUBLED         T  =     882.250000      H  =         .250000      NSTEP  =          25
 *               STEP    DOUBLED         T  =     889.250000      H  =         .500000      NSTEP  =          52
   NODE  T =     .900745093793E+03     .214557320668E+08     .212527764464E+07     -.163423225258E-04
        DT =     .500000000000E+00     .128581828242E+04    -.821146372635E+04     -.243980023999E+05
 *               STEP    DOUBLED         T  =     944.750000      H  =        1.000000      NSTEP  =         162
   NODE  T =     .946658588135E+03    -.218803714357E+08    -.220050623323E+07      .125779257434E-01
        DT =     .100000000000E+01    -.345907455384E+03     .814245712192E+04      .238320373837E+05
   NODE  T =     .990458993524E+03     .214489766159E+08     .219046463027E+07     -.203249489554E+00
        DT =     .100000000000E+01     .131064337857E+04    -.820810237125E+04     -.243172204050E+05
   NODE  T =     .103636699922E+04    -.218706977040E+08    -.226695434615E+07     -.588911761112E-01
        DT =     .100000000000E+01    -.371226613584E+03     .814293063106E+04      .239341151012E+05
   NODE  T =     .108016391663E+04     .214421025123E+08     .225584277698E+07     -.863067201429E-01
        DT =     .100000000000E+01     .133502110587E+04    -.820410225153E+04     -.243065075935E+05
   NODE  T =     .112606552771E+04    -.218608987722E+08    -.233339805792E+07     -.188487221395E+00
        DT =     .100000000000E+01    -.396800041540E+03     .814245997901E+04      .238364978995E+05
   NODE  T =     .116985963199E+04     .214354461178E+08     .232115326113E+07      .183242366425E-01
        DT =     .100000000000E+01     .135985239073E+04    -.819960465312E+04     -.243054490028E+05
   NODE  T =     .121575653757E+04    -.218505799153E+08    -.239962263565E+07     -.349275773535E-03
        DT =     .100000000000E+01    -.421904305512E+03     .814166299668E+04      .238391830641E+05
   NODE  T =     .125954792133E+04     .214287958496E+08     .238602935950E+07     -.143720489610E+00
        DT =     .100000000000E+01     .138359662734E+04    -.819456219999E+04     -.243043612622E+05
   NODE  T =     .130543842259E+04    -.218400481221E+08    -.246518206583E+07     -.153969776460E-01
        DT =     .100000000000E+01    -.447494361867E+03     .814101306788E+04      .238419324156E+05
   NODE  T =     .134922819215E+04     .214216538875E+08     .245114069009E+07     -.134185454353E+00
        DT =     .100000000000E+01     .140705124634E+04    -.818982963050E+04     -.243033933899E+05
   NODE  T =     .139511939074E+04    -.218293480956E+08    -.253158939874E+07     -.190257516319E+00
        DT =     .100000000000E+01    -.473738187344E+03     .813998030347E+04      .239448042440E+05
```

NODE	T =	.143889773764E+04	.214142223518E+08	.251756189895E+07	.238869289165E-01
	DT =	.100000000000E+01	.143189662466E+04	-.818469744155E+04	-.243022798809E+05
NODE	T =	.148477523587E+04	-.218185158357E+08	-.259856294727E+07	-.426012096486E-02
	DT =	.100000000000E+01	-.499292763766E+03	.813348091130E+04	.235474219567E+05
NODE	T =	.152855981410E+04	.214068999360E+08	.258314669414E+07	-.139505778209E+00
	DT =	.100000000000E+01	.145653788076E+04	-.817937123994E+04	-.243110299933E+05
NODE	T =	.157443233330E+04	-.218372374883E+08	-.266469893192E+07	-.176961111494E-01
	DT =	.100000000000E+01	-.524418908623E+03	.813783967260E+04	.239502272862E+05
NODE	T =	.161821359867E+04	.213994585329E+08	.264837440794E+07	-.124191763445E+00
	DT =	.100000000000E+01	.148956649020E+04	-.817509952922E+04	-.242996054642E+05

*** TRAJECTORY TERMINATION

*** THIS CASE TOOK .925 SECONDS TO INTEGRATE A SPAN OF 742.7500 MINUTES ***

*** FROM 879.000 TO 1621.750 MINUTES FROM MIDNIGHT OF EPOCH ***

*** TRACE66 EPHEMERIS OUTPUT KEY ***

DATE,...	ME,MM,ST,DT	X,XD	X,XD - BF	ADBARV	LAT,...	REV,...	REMARK
YR/MO/DAY	MIN FROM EPOCH	X (FT)	X (FT)	ALPHA (DEG)	LATITUDE (DEG)	REV COUNT	.
HR/MIN	MIN FROM MIDNIGHT	Y (FT)	Y (FT)	DELTA (DEG)	LONGITUDE(DEG)	PERIOD	.
SEC	SEC FROM MIDNIGHT	Z (FT)	Z (FT)	BETA (DEG)	ALTITUDE (NM)	PERIOD-DECAY	.
	STEP SIZE(MIN)	XD(FT/SEC)	XD(FT/SEC)	AZIMUTH(DEG)	S-VEH-LAT(DEG)	NOD-REG	.
IT	UTC - IT	YD(FT/SEC)	YD(FT/SEC)	R (FT)	I (DEG)		
	UT1 - IT	ZD(FT/SEC)	ZD(FT/SEC)	V (FT/SEC)	O (DEG)		

*** ECI TRAJECTORY ***

*** CASE 1
***

*** EPOCH PRINT

DATE,...	ME,MM,ST,DT,..	X,XD	X,XD - BF	ADBARV	LAT,.. BF	REV,...
70/ 6/26	0.00000	-.859177872E+06	.552943353E+07	97.13607771	71.23532964	.24863
14/39	879.00000	.862658.2E+07	-.415447366E+07	71.11799655	323.08108931	0.00000
0.00000	52740.00000	.232213836E+08	.232213836E+08	90.56864399	83.70774013	0.00000
	.12500	.257565325E+05	-.164017950E+05	271.44211206	71.23274551	0.00000
IT	0.00000	.251980883E+04	-.236658767E+05	.21371444E+08	108.87579657	
	1.00000	-.322544446E+02	-.322544446E+02	.25879518E+05	51.55699698	

A =	.21737498E+08	MEAN ANOM =	.33005906E+03	APOGEE =	.36474584E+04
E =	.19545978E-01	ECCENTRIC =	.32949051E+03	HEIGHT =	.21121842E+03
I =	.19887580E+03	TRUE ANOM =	.32891708E+03	PERIGEE =	.35076057E+04
O =	.18561199E+03	KEPL PER =	.89453242E+02	HEIGHT =	.71365690E+02
U =	.12058975E+03	ANOM PER =	.89692362E+02	O-DOT =	.28238268E+01
TAU =	.79698652E+03	NODL PER =	.89724174E+02	U-DOT =	-.20803583E+01

*** REQUESTED PRINTS

DATE,...	ME,MM,ST,DT,..	X,XD	X,XD - BF	ADBARV	LAT,.. BF	REV,...
70/ 6/26	21.74509	.214557321E+08	-.149364771E+08	5.65692696	-.00000039	.50000 DSC NODE
15/ 0	90.74509	.212527759E+07	-.155488551E+08	-.00000039	226.15078160	0.00000
44.70563	5404.70563	-.147473157E+00	-.147473157E+00	88.95141266	104.51754274	0.00000
	.50000	.128560810E+04	-.744391549E+04	198.84877695	-.00000039	0.00000
IT	.00000	-.821146374E+04	.649884239E+04	.21560734E+08	108.84667950	
	.00000	-.243080024E+05	-.243080024E+05	.25689695E+05	46.15078174	

DELTA NODE = .013 DELTA V = -89.7141 (18)

DATE,...	ME,MM,ST,DT,..	X,XD	X,XD - BF	ADBARV	LAT,.. BF	REV,...
70/ 6/26	111.45900	.214489767E+08	-.137216942E+08	5.83138148	-.00000693	1.50000 DSC NODE
16/30	990.45900	.219146382E+07	-.871272125E+07	-.00000689	203.83515595	0.00000
27.53971	59427.53971	-.259150097E+01	-.259150097E+01	88.95178468	104.48516846	0.00000
	1.00000	.131064051E+04	-.441879149E+04	198.85054353	-.00000693	0.00000
IT	.00000	-.820811268E+04	.833922557E+04	.21561537E+08	108.85038759	
	1.00000	-.243072204E+05	-.243072204E+05	.25689136E+05	23.83515821	

ITEM	DESCRIPTION	REFERENCE SECTION
18	Delta Node is the difference between the predicted node time and the input node time	2.2.11.1
	Delta V is the difference in velocity at the predicted and input node times	

DELTA NODE = -.011 DELTA V = -.0002

DATE,...	ME,MM,ST,DT,...	X,XD	X,XD - BF	ADBARV	LAT,.. BF	REV,...
70/ 6/26	201.16392	.214421628E+08	-.215528327E+08	6.00577563	-.00001394	2.50000 OSC NODE
18/ 0	1080.16392	.225584116E+07	-.572707417E+06	-.00001295	181.52212002	89.70841
9.83519	64859.83519	-.487416521E+01	-.487416521E+01	88.95319054	104.46935025	0.00000
	1.00000	.133561531E+04	-.731338886E+03	198.85098714	-.00001394	.17480
IT	.00000	-.820410288E+04	.985501748E+04	.215604490E+08	108.84705333	
	.00000	-.243065077E+05	-.243065077E+05	.256884395E+05	1.52212444	

DELTA NODE = -.036 DELTA V = -.0006

DATE,...	ME,MM,ST,DT,...	X,XD	X,XD - BF	ADBARV	LAT,.. BF	REV,...
70/ 6/26	29.85963	.214354463E+08	-.291570499E+08	6.18023193	-.00000957	3.50000 OSC NODE
19/29	1169.85963	.232115205E+07	.765241429E+07	-.00003951	159.21125520	89.69853
51.57806	70191.57806	-.357806384E+01	-.357806384E+01	88.95336690	104.52033191	-.00988
	1.00000	.135984799E+04	.376464178E+04	198.85088939	-.00000957	.17487
IT	0.00000	-.819966514E+04	.939449343E+04	.215607545E+08	108.84140924	
	0.00000	-.243054490E+05	-.243054490E+05	.256873[illegible]4E+05	339.21125844	

DELTA NODE = -.073 DELTA V = -.0012

DATE,...	ME,MM,ST,DT,...	X,XD	X,XD - BF	ADBARV	LAT,.. BF	REV,...
70/ 6/26	381.54792	.214287958E+08	-.157434689E+08	6.35351092	-.00000043	4.50000 OSC NODE
20/59	1259.54792	.238602036E+07	.147319236E+08	-.00000043	136.90107593	89.69101
32.87528	75572.87528	-.159996576E+00	-.159996576E+00	88.95541135	104.59832840	-.00752
	1.00000	.138359652E+04	.640159544E+04	198.84955597	-.00000043	.17449
IT	.00000	-.819456211E+04	.752649396E+04	.215612240E+08	108.83041044	
	0.00000	-.243043612E+05	-.243043612E+05	.256859335E+05	316.90107517	

DELTA NODE = -.123 DELTA V = -.0020

DATE,...	ME,MM,ST,DT,...	X,XD	X,XD - BF	ADBARV	LAT,.. BF	REV,...
70/ 6/26	473.22819	.214216538E+08	-.837383837E+07	6.52865239	.00000493	5.50000 OSC NODE
22/29	1349.22819	.245154134E+07	.196052934E+08	.00009480	114.59476720	89.68158
13.69145	80953.69145	.190533608E+01	.190533608E+01	88.95876518	104.64900019	-.00912
	1.00000	.140725351E+04	.877935830E+04	198.84889739	.00000493	.17288
IT	0.00000	-.818982935E+04	.453185004E+04	.215614770E+08	108.81633541	
	0.00000	-.243033933E+05	-.243033933E+05	.256847825E+05	294.59476556	
70/ 6/26	559.89774	.214142223E+08	-.862508573E+06	6.70513675	.00000142	6.50000 OSC NODE
23/58	1438.89774	.251756207E+07	.215444451E+08	.00001141	92.29255036	89.67197
53.86424	86333.86424	.531000907E+00	.531000907E+00	88.95938690	104.67714663	-.00991
	1.00000	.143185722E+04	.934165309E+04	198.84801388	.00000142	.17518
IT	.00000	-.818409737E+04	.869814706E+03	.215617030E+08	108.79783419	
	0.00000	-.243022799E+05	-.243022799E+05	.256834655E+05	272.29254997	

DELTA NODE = -.203 DELTA V = -.0034

DATE,...	ME,MM,ST,DT,..	X,XD	X,XD - BF	ADBARV	LAT,.. BF	REV,...
70/ 6/27	649.55981	.214069201E+08	.737797002E+07	6.88025536	-.0000358	7.50000 DSC NODE
1/28	1528.55981	.258304619E+07	.202606282E+08	-.00093366	69.99075008	89.66484
33.58890	5313.58890	-.137648336E+01	-.137648336E+01	88.95986531	104.75522760	-.00713
	1.00000	.145653643E+04	.943119771E+04	198.84691285	-.00000368	.17673
IT	0.00000	-.817937142E+04	-.293925337E+04	.21562177E+08	108.84712996	
	0.00000	-.243010299E+05	-.243010299E+05	.25681972E+05	249.99075133	

DELTA NODE = -.233 DELTA V = -.0039

DATE,...	ME,MM,ST,DT,..	X,XD	X,XD - BF	ADBARV	LAT,.. BF	REV,...
70/ 6/27	739.21396	.213994588E+08	.145146072E+08	7.05498826	-.0001259	8.50000 DSC NODE
2/58	1618.21396	.264837286E+07	.159460620E+08	-.00091251	47.69055222	89.65710
12.83771	10692.83771	-.470774157E+01	-.470774157E+01	88.96187226	104.84394478	-.00775
	1.00000	.148056296E+04	.761035070E+04	198.84814915	-.0001259	.17475
IT	0.00000	-.817510032E+04	-.629802904E+04	.21562716E+08	198.84563644	
	.00000	-.242996055E+05	-.242996055E+05	.25680638E+05	227.69035648	

DELTA NODE = -.255 DELTA V = -.0043

** TRAJECTORY TERMINATION

A =	.21783497E+08	MEAN ANOM =	.69639794E+02	APOGEE =	.36587057E+04
E =	.20530278E-01	ECCENTRIC =	.70750326E+02	HEIGHT =	.22279347E+03
I =	.10884909E+03	TRUE ANOM =	.71864713E+02	PERIGEE =	.35114994E+04
O =	.18705511E+03	KEPL PER =	.89737334E+02	HEIGHT =	.75587163E+02
U =	.11848189E+03	ANOM PER =	.89611976E+02	O-DOT =	.27994103E+01
TAU =	.16033909E+04	NODL PER =	.99644152E+02	U-DOT =	-.24713653E+01

*** END OF TRAJECTORY ***

EXIT SEGMENT 50 AT 6.8 SECONDS. EXECUTION TIME FOR SEGMENT 50 WAS .2 CP SECS.

```
ENTER SEGMENT 10 AT      6.8 SECONDS.  EXECUTION TIME FOR SEGMENT 59 WAS       .3 CP SECS.

***********************************  TRAJECTORY INTEGRATION FOR CASE    1  ***********************************

                                     * PREDETERMINED EVENT TABLE *
 TIME(MME)     TYPE        ASSOCIATED QUANTITIES
    900.7449 TZERO
    993.4592 TSTOP

     ***  TRAJECTORY START

     * * * * * * * * * * * * * * * * * * * * *    ECI  * * * * * * * * * * * * * * * * * * * * * * *
SEG11 ENTRY TIME IS     6.85590
   NODE  T =      .900745093793E+03     .214557320664E+08     .212527764462E+07     .351589407213E-04
        DT =      .125000000000E+00     .128583828169E+04    -.821146372636E+04    -.243980023907E+05
 *                STEP   DOUBLED      T  =    904.744900      H  =      .250000     NSTEP  =        31
 *                STEP   DOUBLED      T  =    908.994900      H  =      .500000     NSTEP  =        47
 *                STEP   DOUBLED      T  =    944.994900      H  =     1.000000     NSTEP  =       118
   NODE  T =      .946658589387E+03    -.218803714253E+08    -.220050624666E+07    -.295738854977E-01
        DT =      .100000000000E+01    -.345907508787E+03     .814245711879E+04     .238320373956E+05
   NODE  T =      .990458993426E+03     .214489766135E+08     .219946465603E+07    -.125943905337E+00
        DT =      .100000000000E+01     .131364349429E+04    -.820810236293E+04    -.243072204145E+05

     ***  TRAJECTORY TERMINATION

     ***  THIS CASE TOOK       .473  SECONDS TO INTEGRATE A SPAN OF      93.2500  MINUTES  ***

         ***  FROM          900.745  TO         993.995  MINUTES FROM MIDNIGHT OF EPOCH  ***

ENTER SEGMENT 81 AT      7.3 SECONDS.  EXECUTION TIME FOR SEGMENT 10 WAS       .5 CP SECS.

ENTER SEGMENT 82 AT      7.4 SECONDS.  EXECUTION TIME FOR SEGMENT 81 WAS       .1 CP SECS.
```

```
******************************************** STAGE  4 ***********************************************

STAPASS    YEAR MO DY HR MN  SEC                   RESIDUALS - EXTERNAL UNITS                    MME

393   17   1970  6 26 16  7 20.0000  0.                     .778958E-01 AZ  -.104679E-01 EL   967.333
            PREDICTED RESIDUALS      0.                    0.               0.
393   17   1970  6 26 16  7 19.2528   .519859E+00 SRR  0.               0.                967.321
            PREDICTED RESIDUALS       .222550E+01      0.               0.
393   17   1970  6 26 16  8  4.0000   .448224E+03 RNG   .747379E-01 AZ  -.274641E-01 EL   968.067
            PREDICTED RESIDUALS       .679092E+03      0.               0.
393   17   1970  6 26 16  8  3.2507  -.140781E+00 SRR  0.               0.                968.054
            PREDICTED RESIDUALS       .501885E+01      0.               0.
393   17   1970  6 26 16  8 28.0000   .431812E+03 RNG   .927567E-01 AZ   .460399E-02 EL   968.467
            PREDICTED RESIDUALS       .528062E+03      0.               0.
393   17   1970  6 26 16  8 27.2486  -.624195E+00 SRR  0.               0.                968.454
            PREDICTED RESIDUALS       .775019E+01      0.               0.
393   17   1970  6 26 16  9  0.0000   .363879E+03 RNG   .756500E-01 AZ  -.770405E-02 EL   969.000
            PREDICTED RESIDUALS       .221027E+03      0.               0.
393   17   1970  6 26 16  8 59.2444  -.334749E+01 SRR  0.               0.                968.987
            PREDICTED RESIDUALS       .117638E+02      0.               0.
393   17   1970  6 26 16 10  4.0000   .673896E+02 RNG   .113288E+00 AZ   .338583E-01 EL   970.067
            PREDICTED RESIDUALS       .516391E+03      0.               0.
393   17   1970  6 26 16 10  3.2352  -.449521E+01 SRR  0.               0.                970.054
            PREDICTED RESIDUALS       .804813E+01      0.               0.

           SUMMARY OF PREDICTED STATISTICS
 STA  TYP          RMS         TYP        RMS          TYP        RMS          TYP        RMS

 393  SRR       .765986E+01  RNG       .513694E+03

PREDICTED RESIDUAL RMS =   .5960568927E+02

ENTER SEGMENT 83 AT     7.4 SECONDS.  EXECUTION TIME FOR SEGMENT 82 WAS      .1 CP SECS.

ITERATION NUMBER     1
    9 MEASUREMENTS WERE USED IN THIS SOLUTION
```

CURRENT SOLUTION IS

NAME		CURRENT VALUE	CORRECTION	NEW VALUE	TOTAL CORR.	SIGMA
6820	X	.21455717113563E+08	-.46831099E+02	.21455670282464E+08	-.46831099E+02	.78929819E+02
6820	Y	.21253731238283E+07	-.20865087E+03	.21251644729618E+07	-.20865087E+03	.76947084E+02
6820	Z	.28264314373326E+03	.15964563E+01	.28423960005202E+03	.15964563E+01	.11451517E+03
6820	DX	.12861591970903E+04	-.19185345E+00	.12859673436397E+04	-.19185345E+00	.14809437E+00
6820	DY	-.82114289637110E+04	-.36884704E+00	-.82117978107534E+04	-.36884704E+00	.44335061E-01
6820	DZ	-.24308072381429E+05	-.18313993E-02	-.24308004212928E+05	-.18313993E-02	.93705791E-01
6820	DRAG	.94609076601712E-02	-.24678299E-03	.92141246731143E-02	-.24678299E-03	.32835328E-03

NAME		SIGMA ZERO	SIGMA OEWT	TOTAL CORR.	T.C./SIGMAO	T.C./SIGMAD
6820	X	.86805251E+02	.12145175E+03	-.46831099E+02	-.53949616E+00	-.38559428E+00
6820	Y	.21949089E+02	.95551248E+02	-.20865087E+03	-.95061286E+01	-.21836540E+01
6820	Z	.74856045E+02	.13535311E+03	.15964563E+01	.21327019E-01	.11820952E-01
6820	DX	.15220332E+00	.25054331E+00	-.19185345E+00	-.12605076E+01	-.76574965E+00
6820	DY	.25647653E-01	.11173154E+00	-.36884704E+00	-.14381317E+02	-.33012195E+01
6820	DZ	.72678355E-01	.12624897E+00	-.18313993E-02	-.25198683E-01	-.14506251E-01
6820	DRAG	.41173923E-03	.49792486E-03	-.24678299E-03	-.59936724E+00	-.49562295E+00

RESIDUAL	RMS =	.2241036669E+02
RESIDUAL	SOS =	.4520028818E+04
APRIORI	RMS =	0.
APRIORI	SOS =	0.
TOTAL	SOS =	.4520028818E+04
PREDICTED	SOS =	.3056764551E+02

ATA

	6820 X	6820 Y	6820 Z	6820 DX	6820 DY	6820 DZ	6820 DRAG	
6820 X	.87892E+01							
6820 Y	.65287E+00	.49508E-01						
6820 Z	-.47921E+00	-.33768E-01	.30680E-01					
6820 DX	.12797E+04	.93528E+02	-.73020E+02	.18992E+06				
6820 DY	-.25357E+04	-.19105E+03	.13254E+03	-.36483E+06	.74119E+06			
6820 DZ	-.79119E+04	-.58664E+03	.43293E+03	-.11551E+07	.22793E+07	.71263E+07		
6820 DRAG	-.18049E+05	-.13419E+04	.98224E+03	-.26334E+07	.52186E+07	.16251E+08	.46454E+08	
ATB	.16412E+03	.12971E+02	-.63761E+01	.21334E+05	-.50032E+05	-.14254E+06	-.33427E+06	.45200E+[illegible]

ATA INVERSE

	6820 X	6820 Y	6820 Z	6820 DX	6820 DY	6820 DZ	6820 DRAG
6820 X	.62299E+04						
6820 Y	.15792E+04	.59209E+04					
6820 Z	.872.7E+04	.20185E+04	.13114E+05				
6820 DX	.11196E+02	.42725E+01	.16196E+02	.21932E-01			
6820 DY	.30804E+01	.16927E+01	.45008E+01	.55049E-02	.19656E-02		
6820 DZ	.73431E+01	.22693E+01	.10233E+02	.13585E-01	.35492E-02	.87808E-02	
6820 DRAG	.14115E-02	-.42814E-04	.19356E-03	.32074E-05	.12856E-05	.16789E-05	.10782E-06

CORRELATION MATRIX

6820 X	1.00000						
6820 Y	.26. 2	1.00000					
6820 Z	.96483	.22907	1.00000				
6820 DX	.95780	.37493	.95498	1.00000			
6820 DY	.88028	.49620	.88651	.83843	1.00000		
6820 DZ	.99282	.31472	.95359	.97892	.85432	1.00000	
6820 DRAG	.05446	-.00169	.05146	.06596	.09883	.05457	1.00000

ENTER SEGMENT 84 AT 7.5 SECONDS. EXECUTION TIME FOR SEGMENT 83 WAS .0 CP SECS.

**** ORBITAL ELEMENTS FOR VEHICLE 1 FOR ITERATION 2. ****

YEAR/MO/DY	X	ALPHA	A	AF	MEAN ANOMALY	APOGEE RADIUS
HR/MIN	Y	DELTA	E	AG	ECCENTRIC ANOM	APOGEE HEIGHT
SECONDS	Z	BETA	I	N	TRUE ANOMALY	PERIGEE RADIUS
LATITUDE	XDOT	AZIMUTH	O	L	KEPLERIAN PER	PERIGEE HEIGHT
LONGITUDE	YDOT	RADIUS	U	CHI	ANOMALY PER	O-DOT
HEIGHT	ZDOT	VELOCITY	TAU	PSI	NODAL PERIOD	U-DOT
1970/ 6/26	21455670.282	5.656644001	21797338.583	.0122907020147	58.25015728	3663.69455
15/ 0	2125164.473	.030755345	.02127289999	-.0173630330889	59.3'827585	227.6CF81
44.6940000	284.240	88.951761166	108.849501195	.0667981268134	60.36229594	3511.06657
.0007604	1285.9673436	198.849501195	185.656386129	3.553539325	89.5228781	74.97784
226.1505472	-8211.7978108	21560661.200	119.636955905	-.13779605544	89.6839588	2.7934261179
104.5057	-24308.3042128	25689.8112898	886.2085250	-1.39125344564	89.7161255	-2.0667979488

TOTAL EDIT SUMMARY

STA	N TYP	RMS	RMS/SIG	MEAN	N TYP	RMS	RMS/SIG	MEAN	N TYP	RMS	RMS/SIG	MEAN
393	5 AZ	8.8E-02	0.	8.7E-02	5 EL	2.0E-02	0.	-1.4E-03	5 SRR	2.5E+00	2.5E+01	-1.3E+00
393	4 RNG	3.6E+02	1.8E+01	3.3E+02								

EXIT SEGMENT 84 AT 7.5 SECONDS. EXECUTION TIME FOR SEGMENT 84 WAS .0 CP SECS.

```
ENTER SEGMENT 10 AT     7.5 SECONDS.  EXECUTION TIME FOR SEGMENT 84 WAS      .1 CP SECS.

*********************************** TRAJECTORY INTEGRATION FOR CASE   1 ***********************************

                                            * PREDETERMINED EVENT TABLE *
 TIME(MME)    TYPE         ASSOCIATED QUANTITIES
   900.7449 TZERO
   993.4592 TSTOP

        ***  TRAJECTORY START

        * * * * * * * * * * * * * * * * * * * *   ECI  * * * * * * * * * * * * * * * * * * * *
SEG11 ENTRY TIME IS     7.55800
   NODE  T =      .900745094888E+03     .214556853175E+08     .212506845015E+07     .249001825045E-04
        OT =      .125000000000E+00     .123561444365E+04    -.821183276665E+04    -.243380042222E+05
*                 STEP   DOUBLED        T  =     904.744900     H  =        .250000     NSTEP  =       31
*                 STEP   DOUBLED        T  =     908.994900     H  =        .500000     NSTEP  =       47
*                 STEP   DOUBLED        T  =     944.994900     H  =       1.000000     NSTEP  =      118
   NODE  T =      .946658421521E+03    -.218805759208E+08    -.220031937841E+07    -.296414957399E-01
        DT =      .100000000000E+01    -.346005828944E+03     .814268754826E+04     .238317650500E+05
   NODE  T =      .993459328121E+03     .214489503620E+08     .219025912335E+07    -.126176140433E+00
        OT =      .100000000000E+01     .131048471597E+04    -.820846337396E+04    -.243072204709E+05

        ***  TRAJECTORY TERMINATION

        ***  THIS CASE TOOK      .474  SECONDS TO INTEGRATE A SPAN OF      93.2500  MINUTES  ***

             ***  FROM        900.745  TO        993.995  MINUTES FROM MIDNIGHT OF EPOCH  ***

ENTER SEGMENT 81 AT     8.0 SECONDS.  EXECUTION TIME FOR SEGMENT 10 WAS      .5 CP SECS.

ENTER SEGMENT 82 AT     8.1 SECONDS.  EXECUTION TIME FOR SEGMENT 81 WAS      .1 CP SECS.
```

```
****************************************************** STAGE  4 ******************************************************

STAPASS   YEAR MO DY HR MN  SEC                    RESIDUALS - EXTERNAL UNITS                          MME

393  17   1970  6 26 16  7 29.0000  0.                   .765619E-01 AZ   -.119794E-01 EL   967.333
393  17   1970  6 26 16  7 19.2528  -.507401E-01 SRR  0.                 0.                967.321
393  17   1970  6 26 16  8  4.0000   .425502E+01 RNG   .753160E-01 AZ   -.291289E-01 EL   968.067
393  17   1970  6 26 16  8  3.2507  -.119395E+00 SRR  0.                 0.                968.054
393  17   1970  6 26 16  8 29.0000  -.378171E+00 RNG   .955793E-01 AZ    .285608E-02 EL   968.467
393  17   1970  6 26 16  8 27.2486   .341970E+00 SRR  0.                 0.                968.454
393  17   1970  6 26 16  9  0.0000  -.269536E+01 RNG   .828947E-01 AZ   -.988464E-02 EL   969.000
393  17   1970  6 26 16  8 59.2444  [illegible]  SRR  0.                 0.                968.987
393  17   1970  6 26 16 10  4.0000  -.701194E+01 RNG   .123622E+00 AZ    .301353E-01 EL   970.067
393  17   1970  6 26 16 10  3.2352  -.466441E-02 SRR  0.                 0.                970.054

ENTER SEGMENT 83 AT      841 SECONDS.  EXECUTION TIME FOR SEGMENT 82 WAS      .1 CP SECS.

ITERATION NUMBER      2
    9 MEASUREMENTS WERE USED IN THIS SOLUTION
CURRENT SOLUTION IS

NAME                CURRENT VALUE          CORRECTION        NEW VALUE               TOTAL CORR.      SIGMA
6820     X           .21455670282464E+08    .92491652E-01    .21455670374955E+08    -.46738608E+02    .78930351E+02
6820     Y           .21251644729018E+07    .16091504E-01    .21251644890533E+07    -.20863478E+03    .76946620E+02
6820     Z           .28423961305202E+03    .87796232E-01    .28432739628369E+03     .168425[illegible]E+01    .11451511E+03
6820     DX          .12859673436397E+04    .24579873E-03    .12859675894384E+04    -.19160765E+00    .14809428E+00
6820     DY         -.82117978107534E+04    .50299954E-04   -.82117977604534E+04    -.36879674E+00    .44335549E-01
6820     DZ         -.24308004211828E+05    .12568941E-03   -.24308004087139E+05    -.17057099E-02    .93704834E-01
6820     DRAG        .92141246731143E-02    .88942603E-07    .92142136157169E-02    -.24669404E-03    .32834745E-03

NAME                SIGMA ZERO      SIGMA DEWT      TOTAL CORR.      T.C./SIGMA0      T.C./SIGMAD
6820     X           .86805251E+02   .12145175E+03  -.46738608E+02   -.53843065E+00   -.38483273E+00
6820     Y           .21949089E+02   .95551248E+02  -.20863478E+03   -.95053935E+01   -.21834856E+01
6920     Z           .74856045E+02   .13505311E+03   .16842526E+01    .22499687E-01    .12471039E-01
6820     DX          .15220332E+00   .25054331E+00  -.19160765E+00   -.12588927E+01   -.76476859E+00
6828     DY          .25647653E-01   .11173054E+00  -.36879674E+00   -.14379356E+02   -.33007693E+01
6820     DZ          .72678355E-01   .12624897E+00  -.17057099E-02   -.23469297E-01   -.13510684E-01
6820     DRAG        .41173920E-03   .49792486E-03  -.24669404E-03   -.59915122E+00   -.49544432E+00
```

```
RESIDUAL  RMS =     .1324313099E+01
RESIDUAL  SDS =     .1578424666E+02
APRIORI   RMS =     .1453812521E+01
APRIORI   SOS =     .1479499593E+02
TOTAL     SDS =     .3057924259E+02
PREDICTED SDS =     .3057910301E+02
```

****** LEAST SQUARES PROCESS CONVERGED ******

ATA

	6820 X	6820 Y	6820 Z	6820 DX	6820 DY	6820 DZ	6820 DRAG	
6820 X	.87868E+01							
6820 Y	.65260E+00	.49481E-01						
6820 Z	-.47907E+00	-.33752E-01	.30672E-01					
6820 DX	.12793E+04	.93483E+02	-.72996E+02	.18985E+06				
6820 DY	-.25351E+04	-.19098E+03	.13251E+03	-.36473E+06	.74107E+06			
6820 DZ	-.79097E+04	-.58639E+03	.43280E+03	-.11547E+07	.22788E+07	.71243E+07		
6820 DRAG	-.18059E+05	-.13415E+04	.98279E+03	-.26348E+07	.52219E+07	.16261E+08	.46508E+08	
ATB	-.27693E-01	-.22579E-02	.10488E-02	-.36341E+01	.85895E+01	.24675E+02	.57351E+02	.15784E+02

ATA INVERSE

	6820 X	6820 Y	6820 Z	6820 DX	6820 DY	6820 DZ	6820 DRAG
6820 X	.62300E+04						
6820 Y	.15792E+04	.59208E+04					
6820 Z	.87208E+04	.20185E+04	.13114E+05				
6820 DX	.11196E+02	.42725E+01	.16196E+02	.21932E-01			
6820 DY	.30804E+01	.16927E+01	.45008E+01	.55048E-02	.19656E-02		
6820 DZ	.73431E+01	.22692E+01	.10233E+02	.13585E-01	.35491E-02	.87806E-02	
6820 DRAG	.14102E-02	-.43601E-04	.19339E-02	.32044E-05	.12792E-06	.16770E-05	.10781E-06

CORRELATION MATRIX

6820 X	1.00000						
6820 Y	.26063	1.00000					
6820 Z	.96483	.22907	1.00000				
6820 DX	.95780	.37494	.95498	1.00000			
6820 DY	.88027	.49619	.86659	.83841	1.00000		
6820 DZ	.99282	.31472	.95358	.97691	.85429	1.00000	
6820 DRAG	.05441	-.00173	.05143	.06590	.09879	.05451	1.00000

ENTER SEGMENT 84 AT 8.2 SECONDS. EXECUTION TIME FOR SEGMENT 83 WAS .0 CP SECS.

ATA INVERSE UPDATED TO 990.46 MINUTES FROM MIDNIGHT OF EPOCH

	6820 X	6820 Y	6820 Z	6820 DX	6820 DY	6820 DZ	6820 DRAG
6820 X	.64488E+04						
6820 Y	.22545E+04	.70603E+04					
6820 Z	.10446E+05	.51398E+04	.21586E+05				
6820 DX	.14193E+02	.79367E+01	.25567E+02	.33597E-01			
6820 DY	.33610E+01	.25718E+01	.69484E+01	.85926E-02	.24916E-02		
6820 DZ	.71493E+01	.29442E+01	.12150E+02	.15859E-01	.38137E-02	.87277E-02	
6820 DRAG	-.67963E-02	-.14985E-02	-.27622E-03	-.13003E-04	-.15558E-05	.92745E-06	.10781E-06

G AND G DEWEIGHTING MATRICES FOR VEHICLE 6820

ORBIT PLANE COORDINATE SYSTEM

.33140E+05					
-.28250E-18	.39768E+06				
0.	0.	.31481E+05			
.63892E-10	-.38775E+03	0.	.40832E+00		
-.38775E+02	.33054E-21	0.	-.74757E-13	.45369E-01	
0.	0.	.60694E-10	0.	0.	.43098E-01

PARAMETER SET COORDINATE SYSTEM

.76544E-10					
-.84431E-11	.15836E-09				
-.25985E-10	.25440E-09	.82087E-09			
-.19090E-11	.16972E-10	.50821E-10	.33260E-11		
.15218E-11	.19085E-11	.51080E-11	.30326E-12	.38724E-12	
.50021E-11	.51035E-12	.47902E-15	-.55433E-15	.56828E-14	.37185E-12

**** ORBITAL ELEMENTS FOR VEHICLE 1 FOR NEXT DATA STAGE ****

YEAR/MO/DY	X	ALPHA	A	AF	MEAN ANOMALY	APOGEE RADIUS
HR/MIN	Y	DELTA	E	AG	ECCENTRC ANOM	APOGEE HEIGHT
SECONDS	Z	BETA	I	N	TRUE ANOMALY	PERIGEE RADIUS
LATITUDE	XDOT	AZIMUTH	O	L	KEPLERIAN PER	PERIGEE HEIGHT
LONGITUDE	YDOT	RADIUS	U	CHI	ANOMALY PER	O-DOT
HEIGHT	ZDOT	VELOCITY	TAU	PSI	NODAL PERIOD	U-DOT
1970/ 6/26	21448940.285	5.830716977	21796005.085	.0122908967746	58.37509577	3663.35866
16/30	2190322.224	.000496226	.02124174705	-.0173247199113	59.42292033	227.28738
27.5520000	186.731	88.952055837	108.851268834	.0668042571570	60.47652666	3513.96353
.0004996	1310.7168068	198.851268834	185.830547549	3.728592319	89.8146355	74.89225
203.8346400	-8208.4446951	21560485.867	119.522948988	-.1420292182	89.6757341	2.7942694148
104.4768	-24307.2205315	25689.2489736	975.8954835	-1.3908735027 4	89.7078954	-2.0668271786

LEAST SQUARES PROCESS CONVERGED.

TOTAL EDIT SUMMARY

STA	N TYP	RMS	RMS/SIG	MEAN	N TYP	RMS	RMS/SIG	MEAN	N TYP	RMS	RMS/SIG	MEAN
393	5 AZ	8.8E-02	0.	8.7E-02	5 EL	2.0E-02	0.	-1.4E-03	5 SRR	2.5E+00	2.5E+01	-1.6E+00
393	4 RNG	3.6E+02	1.8E+01	3.3E+02								

```
TYPE  SYMB  MINIMUM          CELTA           MEAN            MAXIMUM         STATION 393   PAGE  1
 AZ    0     .57387975E-01   .58955283E-03   .86865617E-01   .11634326E+00
 EL    1    -.42231769E-01   .81594036E-03  -.14347512E-02   .39362267E-01
 SRR   2    -.55172833E+01   .77994378E-01  -.16175644E+01   .22821545E+01
 RNG   3     .20522196E+02   .61460753E+01   .32782596E+03   .63512972E+03
58040.3.........*.........*.........*.....[..1*.........*.........*.........*......2..*.........*........*
58050.*                                        *                                                        *
58060.*                                        *                                                        *
58070.*                                        *                                                        *
58080.*                1           0           *                  2 3                                    *
58090.*                                        *                                                        *
58100.*                                        *                                                        *
58110.*                                        *       1  0 2    3                                      *
58120.*                                        *                                                        *
58130.*                                        *                                                        *
58140.*                         2   0        1 *      3                                                 *
58150.*                                        *                                                        *
58160.*                                        *                                                        *
58170.*                                        *                                                        *
58180.*                                        *                                                        *
58190.*                                        *                                                        *
58200.*       3   2                            *                                                   1 0  *
     ******************************************** END OF FLOT *****************************************
EXIT SEGMENT 84 AT      8.2 SECCNDS.  EXECUTION TIME FOR SEGMENT 84 WAS      .1 CP SECS.
```

```
ENTER SEGMENT 10 AT      8.3 SECONDS.  EXECUTION TIME FOR SEGMENT 84 WAS      .1 CP SECS.

*********************************** TRAJECTORY INTEGRATION FOR CASE   1 ***********************************

                              * PREDETERMINED EVENT TABLE *
TIME(MME)     TYPE        ASSOCIATED QUANTITIES
  900.7449 TZERO
 1710.8623 TSTOP

      ***  TRAJECTORY START

      * * * * * * * * * * * * * * * * * * * * *   ECI   * * * * * * * * * * * * * * * * * * * * *
SEG11 ENTRY TIME IS     8.28500
  NODE  T =    .900745094888E+03    .214556853175E+08    .212506645015E+07    .249001825611E-04
       DT =    .125000000000E+00    .128561444365E+04   -.821183276665E+04   -.243080042222E+05
*              STEP   DOUBLED       T  =    904.744900    H  =     .250000    NSTEP  =       31
*              STEP   DOUBLED       T  =    908.994900    H  =     .500000    NSTEP  =       47
*              STEP   DOUBLED       T  =    944.994900    H  =    1.000000    NSTEP  =      118
  NODE  T =    .946658421520E+03   -.218805759200E+08   -.220031937833E+07   -.296384232863E-01
       DT =    .100000000000E+01   -.346005828829E+03    .814268754846E+04    .238317650506E+05
  NODE  T =    .990459328118E+03    .214489503552E+08    .219025912275E+07   -.126178562386E+00
       DT =    .100000000000E+01    .131048470487E+04   -.820846837513E+04   -.243372204715E+05
  NODE  T =    .103636736627E+04   -.218709584259E+08   -.226677558889E+07   -.190145021537E+00
       DT =    .100000000000E+01   -.371291710440E+03    .814315097110E+04    .238338023711E+05
  NODE  T =    .108016482728E+04    .214420970916E+08    .225564089033E+07    .249077166401E-01
       DT =    .100000000000E+01    .133489785183E+04   -.820446492012E+04   -.243065056935E+05
  NODE  T =    .112606667318E+04   -.218612060236E+08   -.233322742759E+07   -.287888275413E-01
       DT =    .100000000000E+01   -.396830883000E+03    .814267047935E+04    .238361445926E+05
  NODE  T =    .116986136344E+04    .214354619290E+08    .232095482429E+07   -.875129546175E-01
       DT =    .100000000000E+01    .135976454030E+04   -.819996368218E+04   -.243054449618E+05
  NODE  T =    .121575870823E+04   -.218509541784E+08   -.239946042615E+07    .134356494768E-01
       DT =    .100000000000E+01   -.421900819519E+03    .814186376282E+04    .238387888402E+05
  NODE  T =    .125955022108E+04    .214288330962E+08    .238582544738E+07   -.185496524660E+00
       DT =    .100000000000E+01    .138354463825E+04   -.819491723647E+04   -.243043549345E+05
  NODE  T =    .130544186680E+04   -.218404794534E+08   -.246502846690E+07   -.166951080178E+00
       DT =    .100000000000E+01   -.447456215326E+03    .814120437566E+04    .238414972547E+05
  NODE  T =    .134923230822E+04    .214217126726E+08    .245134928173E+07    .172003887558E-01
       DT =    .100000000000E+01    .140703523253E+04   -.819018057379E+04   -.243033845498E+05
  NODE  T =    .139511535951E+04   -.218298360286E+08   -.253144436226E+07   -.672241114136E-01
       DT =    .100000000000E+01   -.473664763942E+03    .814006251932E+04    .238443285028E+05
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NODE  T =   .143890341775E+04   .214143930173E+08   .251737365455E+07  -.483251352040E-01
     DT =   .100000000000E+01   .143197618436E+04  -.818504387135E+04  -.243922684018E+05
NODE  T =   .148478197219E+04  -.218193607521E+08  -.259842659783E+07   .184823510083E-01
     DT =   .100000000000E+01  -.499183945199E+03   .813865422107E+04   .238469054249E+05
NODE  T =   .152855731776E+04   .214070028286E+08   .258286156986E+07  -.192848794083E+00
     DT =   .100000000000E+01   .145659338644E+04  -.817971391562E+04  -.243910155487E+05
NODE  T =   .157444108760E+04  -.218078394785E+08  -.266457146476E+07  -.166571505540E+00
     DT =   .100000000000E+01  -.524274479972E+03   .813800329923E+04   .238496698736E+05
NODE  T =   .161822351636E+04   .213995838503E+08   .264819264741E+07   .190298708107E-01
     DT =   .100000000000E+01   .148065841645E+04  -.817543636605E+04  -.242995880300E+05
NODE  T =   .166409599975E+04  -.217962812645E+08  -.273067911266E+07  -.468055256516E-01
     DT =   .100000000000E+01  -.550156266870E+03   .813757464437E+04   .234525181497E+05
NODE  T =   .170786971.96E+04   .213917629830E+08   .271341376866E+07  -.793433913318E-01
     DT =   .100000000000E+01   .150503006250E+04  -.817111856921E+04  -.242982759545E+05

   ***  TRAJECTORY TERMINATION

   ***  THIS CASE TOCK      .965  SECONDS TO INTEGRATE A SFAN OF    810.2500  MINUTES  ***

      ***  FROM        900.745  TO       1710.995  MINUTES FROM MIDNIGHT OF EPOCH  ***

ENTER SEGMENT 50 AT     9.3 SECONDS. EXECUTION TIME FOR SEGMENT  10 WAS     1.0 CP SECS
                              *** TRACE66 EPHEMERIS OUTPUT KEY ***


DATE,...     ME,MM,ST,DT         X,XD          X,XD - BF     ADBARV          LAT,...           REV,...     REMARK

YR/MO/DAY    MIN FROM EPOCH      X (FT)        X (FT)        ALPHA   (DEG)   LATITUDE (DEG)    REV COUNT      .
HR/MIN       MIN FROM MIDNIGHT   Y (FT)        Y (FT)        DELTA   (DEG)   LONGITUDE(DEG)    PERIOD         .
SEC          SEC FROM MIDNIGHT   Z (FT)        Z (FT)        BETA    (DEG)   ALTITUDE (NM)     PERIOD-DECAY   .
             STEP SIZE(MIN)      XD(FT/SEC)    XD(FT/SEC)    AZIMUTH(DEG)    S-VEH-LAT(DEG)    NOD-REG        .
IT           UTC - IT            YD(FT/SEC)    YD(FT/SEC)    R       (FT)    I        (DEG)
             UT1 - IT            ZD(FT/SEC)    ZD(FT/SEC)    V   (FT/SEC)    O        (DEG)

                              * * *     ECI  TRAJECTORY     * * *
```

```
*** CASE      1
***


*** EPOCH PRINT

DATE,...  ME,MM,ST,DT,..         X,XD             X,XD - BF          ADBARV           LAT,.. BF       REV,...
70/ 6/26        0.00000   .214556703E+08   -.149364904E+08      5.65664410        .00076044       .50000
 15/ 0        900.74490   .212516447E+07   -.155487417E+08       .00075524     226.15054724      0.00000
44.69400    54044.69400   .284239600E+03    .284239600E+03     88.95176117     104.50568731      0.00000
                 .12500   .128596734E+04   -.744424983E+04    198.84950120        .00076028      0.00000
IT               .00000   -.821179781E+04   .649898865E+04   .215606615E+08    108.84950120
                0.00000   -.243080042E+05  -.243080042E+05   .256898115E+05     46.15028938

  A  =   .21797339E+08     MEAN ANOM   =   .58260157E+02    APOGEE   =   .36636945E+04
  E  =   .21272900E-01     ECCENTRIC   =   .59308276E+02    HEIGHT   =   .22760581E+03
  I  =   .10884950E+03     TRUE ANOM   =   .60362206E+02    PERIGEE  =   .35110666E+04
  O  =   .18565639E+03     KEPL PER    =   .89822878E+02    HEIGHT   =   .74977836E+02
  U  =   .11963700E+03     ANOM PER    =   .89683959E+02    O-DCT    =   .27934261E+01
 TAU =   .88620852E+03     NODL PER    =   .89716126E+02    U-DCT    =  -.20667979E+01

*** REQUESTED PRINTS

DATE,...  ME,MM,ST,DT,..         X,XD             X,XD - BF          ADBARV           LAT,.. BF       REV,...
70/ 6/26         .00019   .214556853E+08   -.149365774E+08      5.65638613        .00000000       .50000 OSC NODE
 15/ 0        900.74509   .212506845E+07   -.155486657E+08       .00000000     226.15024052      0.00000
44.70569    54044.70569   .249001808E-04    .249685575E-04     88.95175381     104.50659261      0.00000
                 .12500   .128561444E+04   -.744424894E+04    198.84950119        .00000000      0.00000
IT              0.00000   -.821183277E+04   .649898959E+04   .215606675E+08    108.84953480
                 .00000   -.243080042E+05  -.243080042E+05   .256898005E+05     46.15024052

 DELTA NODE =       .013   DELTA V =    -89.7141

DATE,...  ME,MM,ST,DT,..         X,XD             X,XD - BF          ADBARV           LAT,.. BF       REV,...
70/ 6/26       89.71443   .214489506E+08   -.197217459E+08      5.83054327       -.00001264      1.50000 OSC NODE
 16/30        990.45933   .219025757E+07   -.871248832E+07      -.00001255     203.83443338      0.00000
27.55988    59427.55988   -.472287522E+01  -.472287522E+01     88.95205994     104.47743949      0.00000
                1.00000   .131047915E+04   -.441872337E+04    198.85126884       -.00001263      0.00000
IT               .00000   -.820846896E+04   .883963313E+04   .215604990E+08    108.84877665
                0.30000   -.243072205E+05  -.243072205E+05   .256892455E+05     23.834.3767
```

DELTA NODE = .009 DELTA V = -89.7052

DATE,...	ME,MM,ST,DT,..	X,XD	X,XD - BF	ADBARV	LAT,.. BF	REV,...
70/ 6/26	179.41993	.214420973E+08	-.215528138E+08	6.00524419	-.00001096	2.50000 DSC NODE
18/ 0	1080.16483	.225563950E+07	-.572420969E+06	-.00001088	181.52136040	89.70894
9.88981	64809.88981	-.409559499E+01	-.409559499E+01	88.95338154	104.46438428	0.00000
	1.00000	.133489282E+04	-.731134537E+03	198.85171352	-.00001096	.17481
IT	0.00000	-.820446546E+04	.985537073E+04	.21560414E+08	108.84372393	
	0.00000	-.243065057E+05	-.243065057E+05	.25688546E+05	1.52136411	

DELTA NODE = .019 DELTA V = -89.6960

DATE,...	ME,MM,ST,DT,..	X,XD	X,XD - BF	ADBARV	LAT,.. BF	REV,...
70/ 6/26	269.11646	.214354620E+08	-.201569164E+08	6.17970566	-.00000244	3.50000 DSC NODE
19/29	1169.86136	.232095455E+07	.765274995E+07	-.00000242	159.21029533	89.69931
51.68184	70191.68184	-.912413357E+00	-.912413357E+00	88.95348062	104.51999436	-.00964
	1.00000	.135976345E+04	.316496424E+04	198.85161678	-.00000244	.17488
IT	0.00000	-.819996379E+04	.939474601E+04	.21560749E+08	108.83489710	
	0.00000	-.243054449E+05	-.243054449E+05	.25687410E+05	339.21029616	

DELTA NODE = .031 DELTA V = -89.6886

DATE,...	ME,MM,ST,DT,..	X,XD	X,XD - BF	ADBARV	LAT,.. BF	REV,...
70/ 6/26	358.80582	.214288330E+08	-.157431650E+08	6.35298685	.00000435	4.50000 DSC NODE
20/59	1259.55072	.238582606E+07	.147322709E+08	.00000433	136.89984942	89.69203
33.04319	75573.04319	.162767580E+01	.162767580E+01	88.95544874	104.60096574	-.00727
	1.00000	.138354675E+04	.640200088E+04	198.85028451	.00000435	.17450
IT	0.00000	-.819491698E+04	.752659943E+04	.21561240E+08	108.82137302	
	0.00000	-.243043549E+05	-.243043549E+05	.25686038E+05	316.89984794	

DELTA NODE = .045 DELTA V = -89.6802

DATE,...	ME,MM,ST,DT,..	X,XD	X,XD - BF	ADBARV	LAT,.. BF	REV,...
70/ 6/26	448.48741	.214217126E+08	-.897332123E+07	6.52812849	.00000286	5.50000 DSC NODE
22/29	1349.23231	.245134964E+07	.196055704E+08	.00000284	114.59321131	89.68316
13.93845	80953.93845	.106826385E+01	.106826385E+01	88.95872605	104.64604163	-.00887
	1.00000	.140703647E+04	.877978738E+04	198.84962701	.00000286	.17280
IT	0.00000	-.819018042E+04	.453177263E+04	.21561514E+08	108.80471249	
	0.00000	-.243033845E+05	-.243033845E+05	.25684885E+05	294.59321034	

DELTA NODE = .089 DELTA V = -89.6688

DATE,...	ME,MM,ST,DT,..	X,XD	X,XD - BF	ADBARV	LAT,.. BF	REV,...
70/ 6/26	538.15852	.214143039E+08	-.861778912E+06	6.70467415	-.00000194	6.50000 DSC NODE
23/58	1438.90342	.251737354E+07	.215445325E+08	-.00000103	92.29060370	89.67349
54.20508	86334.20508	-.389226012E+00	-.389226012E+00	88.95926901	104.68671713	-.00966
	1.00000	.143190578E+04	.984202325E+04	198.84874451	-.00000104	.17518
IT	0.00000	-.818504392E+04	.860547767E+03	.215617615E+08	108.84898509	
	.00000	-.243022684E+05	-.243022684E+05	.25683566E+05	272.29050495	

DELTA NODE = .138 DELTA V = -89.6603

DATE,...	ME,MM,ST,DT,..	X,XD	X,XD - BF	ADBARV	LAT,.. BF	REV,...
70/ 6/27	627.82241	.214070031E+08	.737884687E+07	6.87976210	-.00001074	7.50000 DSC NODE
1/28	1528.56731	.258286027E+07	.212603940E+08	-.00001067	69.98134783	89.66661
34.03862	5314.03862	-.401596464E+01	-.401596464E+01	88.95966903	104.76339940	-.00688
	1.00000	.145658878E+04	.943143079E+04	198.84764484	-.00001074	.17673
IT	0.00000	-.817971359E+04	-.293868518E+04	.21562257E+08	108.84642285	
	0.00000	-.243010156E+05	-.243010156E+05	.25682070E+05	249.98835147	

DELTA NODE = .217 DELTA V = -89.6509

DATE,...	ME,MM,ST,DT,..	X,XD	X,XD - BF	ADBARV	LAT,.. BF	REV,...
70/ 6/27	717.47862	.213995841E+08	.145154875E+08	7.05446814	-.00001198	8.50000 DSC NODE
2/58	1618.22352	.264819113E+07	.159453987E+08	-.00001190	47.68753614	89.65912
13.41117	10693.41117	-.447732963E+01	-.447732963E+01	88.96159726	104.86063367	-.00750
	1.00000	.148765295E+04	.761037231E+04	198.84887339	-.00001197	.17475
IT	0.00000	-.817543706E+04	-.629855848E+04	.21562818E+08	108.84221351	
	.00000	-.242995881E+05	-.242995881E+05	.25680734E+05	227.68764020	

DELTA NODE = .318 DELTA V = -89.6388

DATE,...	ME,MM,ST,DT,..	X,XD	X,XD - BF	ADBARV	LAT,.. BF	REV,...
70/ 6/27	807.12481	.213917630E+08	.194805004E+08	7.22901183	-.00000266	9.50000 DSC NODE
4/27	1707.86971	.271341346E+07	.924555265E+07	-.00001264	25.38927320	89.64951
52.18270	16072.18270	-.994935475E+00	-.994935475E+00	88.96277893	104.91796446	-.00961
	1.00000	.150502887E+04	.465099874E+04	198.85016274	-.00000266	.17482
IT	0.00000	-.817111871E+04	-.871556180E+04	.21563166E+08	108.83369697	
	.00000	-.242982759E+05	-.242982759E+05	.25679535E+05	205.38927410	

DELTA NODE = .443 DELTA V = -89.6276

```
      **   TRAJECTORY TERMINATION

 A   =   .21784133E+08    MEAN ANOM  =   .64068895E+02    APOGEE  =   .36592199E+04
 E   =   .20643942E-01    ECCENTRIC  =   .65142122E+02    HEIGHT  =   .22332311E+03
 I   =   .10885036E+03    TRUE ANOM  =   .66220110E+02    PERIGEE =   .35111943E+04
 O   =   .18722902E+03    KEPL PER   =   .89741261E+02    HEIGHT  =   .75297496E+02
 U   =   .11837888E+03    ANOM PER   =   .89605599E+02    O-DOT   =   .27993325E+01
 TAU =   .16930237E+04    NODL PER   =   .89637770E+02    U-DOT   =  -.20708795E+01

      ***  END OF TRAJECTORY  ***

EXIT SEGMENT 50 AT      9.5 SECONDS.  EXECUTION TIME FOR SEGMENT 50 WAS      .3 CP SECS.
ENTER SEGMENT 10 AT     9.5 SECONDS.  EXECUTION TIME FOR SEGMENT 50 WAS      .3 CP SECS.

************************************  TRAJECTORY INTEGRATION FOR CASE   1  ************************************

                                   * PREDETERMINED EVENT TABLE *
 TIME(MME)    TYPE        ASSOCIATED QUANTITIES
   990.4592 TZERO
  1067.0233 TSTOP

     ***   TRAJECTORY START

     * * * * * * * * * * * * * * * * * * * * *   ECI   * * * * * * * * * * * * * * * * * * * * *
SEG11 ENTRY TIME IS      9.56500
  NODE  T =     .990459328035E+03     .214489503527E+08     .219025916574E+07     .345415535802E-04
       DT =     .125000000000E+00     .131943502891E+04    -.820846836465E+04    -.243972205316E+05
 *              STEP   DOUBLED        T  =    994.459200     H  =       .250000     NSTEP  =        31
 *              STEP   DOUBLED        T  =    998.709200     H  =       .500000     NSTEP  =        47
 *              STEP   DOUBLED        T  =   1020.209200     H  =      1.000000     NSTEP  =        89
  NODE  T =     .103636736739E+04    -.218709586538E+08    -.226677558081E+07    -.996434377020E-01
       DT =     .100000000000E+01    -.371291430118E+03     .814315093846E+04     .238338021858E+05

     ***   TRAJECTORY TERMINATION

     ***   THIS CASE TOOK       .392  SECONDS TO INTEGRATE A SPAN OF      76.7500  MINUTES  ***

          ***  FROM        990.459  TO       1067.209  MINUTES FROM MIDNIGHT OF EPOCH  ***

ENTER SEGMENT 81 AT     10.0 SECONDS.  EXECUTION TIME FOR SEGMENT 10 WAS      .4 CP SECS.

ENTER SEGMENT 82 AT     10.0 SECONDS.  EXECUTION TIME FOR SEGMENT 81 WAS      .1 CP SECS.
```

```
******************************************************* STAGE  5 ********************************************************

STAPASS   YEAR MO DY HR MN  SEC                   RESIDUALS - EXTERNAL UNITS                        MME


            SUMMARY OF PREDICTED STATISTICS
 STA  TYP          RMS          TYP          RMS          TYP          RMS          TYP          RMS


PREDICTED RESIDUAL RMS =  0.

ENTER SEGMENT 83 AT     10.0 SECONDS.  EXECUTION TIME FOR SEGMENT 82 WAS      .0 CP SECS.

ITERATION NUMBER      1
    0 MEASUREMENTS WERE USED IN THIS SOLUTION
CURRENT SOLUTION IS

NAME                 CURRENT VALUE          CORRECTION        NEW VALUE                TOTAL CORR.      SIGMA
6820      X           .21448940284574E+08 -0.               .21448940284574E+08  0.                 .19991533E+03
6820      Y           .21903222239458E+07 -0.               .21903222239458E+07  0.                 .27639606E+03
6820      Z           .18673059803602E+03 -0.               .18673059803602E+03  0.                 .61727697E+03
6820      DX          .13107168068238E+04 -0.               .13107168068238E+04  0.                 .66193016E+00
6820      DY         -.82084446951080E+04 -0.              -.82084446951080E+04  0.                 .22269565E+00
6820      DZ         -.24307220531520E+05 -0.              -.24307220531520E+05  0.                 .23207673E+00
6820      DRAG        .92142136157169E-02 -0.               .92142136157169E-02  0.                 .43152294E-03

NAME                 SIGMA ZERO      SIGMA DEWT      TOTAL CORR.      T.C./SIGMAO      T.C./SIGMAD
6820      X           .80304656E+02   .19991533E+03  0.               0.               0.
6820      Y           .84025871E+02   .27639606E+03  0.               0.               0.
6820      Z           .14692307E+03   .61727697E+03  0.               0.               0.
6820      DX          .1832958[illegible]E+00   .66193016E+00  0.               0.               0.
6820      DY          .49916415E-01   .22269565E+00  0.               0.               0.
6820      DZ          .93422328E-01   .23207673E+00  0.               0.               0.
6820      DRAG        .32834745E-03   .43152294E-03  0.               0.               0.

RESIDUAL   RMS =     0.
RESIDUAL   SOS =     0.
APRIORI    RMS =     0.
APRIORI    SOS =     0.
TOTAL      SOS =     0.
PREDICTED  SOS =     0.
```

****** LEAST SQUARES PROCESS CONVERGED ******

ATA

	6820 X	6820 Y	6820 Z	6820 DX	6820 DY	6820 DZ	6820 DRAG	
6820 X	.42654E-02							
6820 Y	.43729E-03	.72280E-04						
6820 Z	.35167E-04	.47189E-05	.31884E-04					
6820 DX	.86672E-01	-.15421E-03	-.27604E-01	.32051E+02				
6820 DY	-.11819E+01	-.12293E+00	-.12498E-01	-.23336E+02	.35021E+03			
6820 DZ	-.34489E+01	-.35443E+00	-.27134E-01	-.71543E+02	.95440E+03	.28076E+04		
6820 DRAG	.17261E+03	.17276E+02	-.52806E+03	.55206E+04	-.47603E+05	-.13977E+06	.12492E+08	
ATB	-0.	-0.	-0.	-0.	-0.	-0.	-0.	0.

ATA INVERSE

	6820 X	6820 Y	6820 Z	6820 DX	6820 DY	6820 DZ	6820 DRAG
6820 X	.39966E+05						
6820 Y	-.14426E+04	.76395E+05					
6820 Z	-.93284E+03	.11654E+06	.38103E+06				
6820 DX	.26085E+00	.13180E+03	.39062E+03	.43815E+00			
6820 DY	.14467E+02	.16500E+02	.44227E+02	.45480E-01	.49593E-01		
6820 DZ	.43655E+02	.66731E+01	.12154E+02	.15792E-01	.45049E-02	.53860E-01	
6820 DRAG	-.67963E-02	-.14995E-02	-.27622E-03	-.13003E-04	-.15558E-05	.92745E-06	.18621E-06

CORRELATION MATRIX

6820 X	1.00000						
6820 Y	-.02611	1.00000					
6820 Z	-.00756	.68304	1.00000				
6820 DX	.00197	.72040	.95601	1.00000			
6820 DY	.32496	.26807	.32173	.30853	1.00000		
6820 DZ	.94492	.10493	.08484	.10280	.08716	1.00000	
6820 DRAG	-.07878	-.01256	-.00104	-.04552	-.01619	.00926	1.00000

ENTER SEGMENT 84 AT 10.1 SECONDS. EXECUTION TIME FOR SEGMENT 83 WAS .0 CP SECS.

ATA INVERSE UPDATED TO 1064.02 MINUTES FROM MIDNIGHT OF EPOCH

	6820 X	6820 Y	6820 Z	6820 OX	6820 OY	6820 DZ	6820 DRAG
6820 X	.70452E+06						
6820 Y	-.31055E+05	.33116E+05					
6820 Z	-.29886E+06	.15288E+05	.16949E+06				
6820 OX	-.29719E+03	.18419E+00	.92422E+02	.16470E+00			
6820 OY	-.28220E+03	.16385E+02	.12679E+03	.11297E+00	.16428E+00		
6820 DZ	-.72500E+03	.38832E+02	.34171E+03	.29466E+00	.29239E+00	.81388E+00	
6820 ORAG	.14836E+00	-.61493E-02	-.63494E-01	-.77262E-04	-.64779E-04	-.15291E-03	.18621E-06

G AND G OEWEIGHTING MATRIOES FOR VEHICLE 6820

ORBIT PLANE COOROINATE SYSTEM

.29549E+05					
-.30492E+04	.39486E+06				
0.	0.	.28070E+05			
.84176E+01	-.38108E+03	0.	.38510E+00		
-.34574E+02	.35677E+01	0.	-.98490E-02	.40454E-01	
0.	0.	.46071E+01	0.	0.	.32204E-01

PARAMETER SET COORDINATE SYSTEM

.78319E-09					
-.24473E-10	.55341E-10				
-.29040E-09	.11061E-10	.18480E-09			
-.18272E-10	-.87267E-12	.32239E-11	.63768E-12		
-.16232E-10	.12518E-11	.67533E-11	.32176E-12	.59577E-12	
-.41458E-10	.20712E-11	.19294E-10	.82234E-12	.86483E-12	.25299E-11

```
**** ORBITAL ELEMENTS FOR VEHICLE    1 FOR NEXT DATA STAGE ****

 YEAR/MC/DY          X              ALPHA              A                AF              MEAN ANOMALY    APOGEE RADIUS
    HR/MIN           Y              DELTA              E                AG              ECCENTRIC ANOM  APOGEE HEIGHT
   SECONDS           Z               BETA              I                N               TRUE ANOMALY    PERIGEE RADIUS
  LATITUDE         XDOT            AZIMUTH             O                L               KEPLERIAN PER   PERIGEE HEIGHT
 LONGITUDE         YDOT             RADIUS             U               CHI               ANOMALY PER            O-DOT
    HEIGHT         ZDOT           VELOCITY            TAU              PSI               NODAL PERIOD           U-DOT

 1970/ 6/26      7592292.341     43.413755895     21743202.958   .0107336266829      355.75494988      3648.41715
    17/44        7183127.603     60.643103110     .01954638714  -.0163355596314      355.67040241       212.67450
 1.3979200      18581636.620     90.084563566     108.874728438  .0670477502187      355.58501467      3508.52480
 60.8072627   24094.8386435     221.289960530     185.982094698  299.062715447        89.4884613        72.78214
222.9763031    -771.9219982     21319414.735     117.325670862  -.145777143567       89.6711960      2.8210805775
   73.5841    -9593.4692110     25944.8301693     975.5900679  -1.39109474719        89.7032075     -2.0786973148

LEAST SQUARES PROCESS CONVERGED.

EXIT SEGMENT 84 AT     10.1 SECONDS.  EXECUTION TIME FOR SEGMENT 84 WAS      .0 CP SECS.
ENTER SEGMENT 1. AT     10.1 SECONDS.  EXECUTION TIME FOR SEGMENT 84 WAS      .1 CP SECS.

 ***********************************  TRAJECTORY INTEGRATION FOR CASE   1  ***********************************

                                       * PREDETERMINED EVENT TABLE *
 TIME(MPE)    TYPE        ASSOCIATED QUANTITIES
  1064.0233 TZERO
  1083.1645 TSTOP

        ***  TRAJECTORY START

        * * * * * * * * * * * * * * * * * * * *   ECI   * * * * * * * * * * * * * * * * * * * *
SEG11 ENTRY TIME IS    10.14900
 *                STEP    DOUBLED          T  =  1067.273299      H  =        .250000      NSTEP  =        25
 *                STEP    DOUBLED          T  =  1071.523299      H  =        .500000      NSTEP  =        41
    NODE  T =     .1080164827996E+04    .2144209706730E+08    .2255640877770E+07    -.3095510678940E-02
          CT =    .5000000000000E+00    .1334898023190E+04   -.8204464949200E+04    -.2430650582450E+05

        ***  TRAJECTORY TERMINATION

        ***  THIS CASE TOOK       .213  SECONDS TO INTEGRATE A SPAN OF     19.5000  MINUTES  ***

             ***  FROM        1064.023  TO       1083.523  MINUTES FROM MIDNIGHT OF EPOCH  ***

ENTER SEGMENT 81 AT     10.4 SECONDS.  EXECUTION TIME FOR SEGMENT 10 WAS      .2 CP SECS.

ENTER SEGMENT 82 AT     10.4 SECONDS.  EXECUTION TIME FOR SEGMENT 81 WAS      .1 CP SECS.
```

```
*********************************************** STAGE 6 ************************************************

STAPASS   YEAR MO DY HR MN  SEC                     RESIDUALS - EXTERNAL UNITS                          MME

343  18   1970  6 26 17 44 23.0000  -.101891E+04 RNG  -.753545E-02 AZ  -.124282E-01 EL   1064.333
            PREDICTED RESIDUALS      .872341E+03      0.                0.
343  18   1970  6 26 17 44 19.2525   .491889E+01 SRR  0.                0.                1064.321
            PREDICTED RESIDUALS      .410377E+01      0.                0.
343  18   1970  6 26 17 44 40.0000  -.897623E+03 RNG  -.758193E-01 AZ  -.210287E-01 EL   1064.667
            PREDICTED RESIDUALS      .779368E+03      0.                0.
343  18   1970  6 26 17 44 39.2512   .791119E+01 SRR  0.                0.                1064.654
            PREDICTED RESIDUALS      .637908E+01      0.                0.
343  18   1970  6 26 17 45 56.0000   .377287E+03 RNG   .266531E-01 AZ  -.524774E-01 EL   1065.933
            PREDICTED RESIDUALS      .341341E+03      0.                0.
343  18   1970  6 26 17 45 55.2392   .211965E+02 SRR  0.                0.                1065.921
            PREDICTED RESIDUALS      .163673E+02      0.                0.
343  18   1970  6 26 17 46 36.0000   .997313E+03 RNG   .420406E-01 AZ  -.651275E-01 EL   1066.600
            PREDICTED RESIDUALS      .745360E+03      0.                0.
343  18   1970  6 26 17 46 35.2336   .103505E+02 SRR  0.                0.                1066.587
            PREDICTED RESIDUALS      .809252E+01      0.                0.
343  18   1970  6 26 17 47 32.0000   .132342E+04 RNG  -.361294E-01 AZ  -.661090E-01 EL   1067.533
            PREDICTED RESIDUALS      .970787E+03      0.                0.
343  18   1970  6 26 17 47 31.2308   .298569E+01 SRR  0.                0.                1067.521
            PREDICTED RESIDUALS      .244620E+01      0.                0.

          SUMMARY OF PREDICTED STATISTICS
 STA  TYP          RMS         TYP        RMS          TYP        RMS          TYP        RMS

 343  RNG      .772325E+03    SRR      .890966E+01

PREDICTED RESIDUAL RMS =    .6865373078E+02

ENTER SEGMENT 83 AT     10.5 SECONDS.  EXECUTION TIME FOR SEGMENT 82 WAS      .0 CP SECS.

ITERATION NUMBER     1
   10 MEASUREMENTS WERE USED IN THIS SOLUTION
```

CURRENT SOLUTION IS

NAME		CURRENT VALUE	CORRECTION	NEW VALUE	TOTAL CORR.	SIGMA
6820	X	.7592292341 0693E+07	.11507256E+04	.75934430666913E+07	.11507256E+04	.29649739E+02
6820	Y	.71831276326843E+07	-.18282883E+01	.71831257743959E+07	-.18282883E+01	.28396897E+02
6820	Z	.18581636620026E+08	-.83642102E+03	.18580800199004E+08	-.83642102E+03	.39504959E+02
6820	DX	.24094838643523E+05	-.20868619E+00	.24094629957333E+05	-.20868619E+00	.12497134E+00
6820	DY	-.77192199815084E+03	-.47311194E+00	-.77239501008648E+03	-.47301194E+00	.28259268E+00
6820	DZ	-.95904692109553E+04	-.14318469E+01	-.95919000578832E+04	-.14308469E+01	.21595331E+00
6820	DRAG	.92142136157169E-02	.14590979E-03	.93601234080069E-02	.14590979E-03	.40531016E-03

NAME		SIGMA ZERO	SIGMA DEWT	TOTAL CORR.	T.C./SIGMA0	T.C./SIGMAD
6820	X	.83935591E+03	.10234573E+04	.11507256E+04	.13709627E+01	.11243514E+01
6820	Y	.18197590E+03	.24845168E+03	-.18282883E+01	-.10046705E-01	-.73587279E-02
6820	Z	.41169340E+03	.50041317E+03	-.83642102E+03	-.20316690E+01	-.16714608E+01
6820	DX	.40583081E+00	.49220109E+00	-.20868619E+00	-.51421968E+00	-.42398563E+00
6820	DY	.40530984E+00	.48656132E+00	-.47301194E+00	-.11670379E+01	-.97215276E+00
6820	DZ	.90215315E+00	.10590583E+01	-.14308469E+01	-.15860355E+01	-.13510559E+01
6820	DRAG	.43152294E-03	.43152294E-03	.14590979E-03	.33812755E+00	.33812755E+00

```
RESIDUAL   RMS =   .87774152 38E+02
RESIDUAL   SOS =   .77043018 27E+05
APRIORI    RMS =  0.
APRIORI    SOS =  0.
TOTAL      SOS =   .77043018 27E+05
PREDICTED  SOS =   .67069477 46E+01
```

ATA

	6820 X	6820 Y	6820 Z	6820 DX	6820 DY	6820 DZ	6820 DRAG
6820 X	.29217E-01						
6820 Y	-.45035E-02	.19858E-01					
6820 Z	-.13208E-01	.50896E-02	.12439E-01				
6820 DX	.47493E+01	-.77598E+00	.20907E+01	.43095E+04			
6820 DY	.14339E+01	.15532E+01	-.87915E+00	-.18952E+03	.29649E+03		
6820 DZ	-.25336E+01	.64220E+00	-.59693E+00	-.19689E+04	.82272E+02	.93689E+03	
6820 DRAG	.86219E+02	.13425E+03	.30759E+03	.25321E+06	-.10100E+05	-.10545E+05	.25437E+08
ATB	.46653E+02	-.10948E+02	-.24734E+02	.57163E+04	.21626E+04	-.34013E+04	-.51695E+05

.77043E+05

```
ATA INVERSE

              6820 X       6820 Y       6820 Z       6820 DX      6820 DY      6820 DZ      6820 DRAG
6820 X       .87911E+03
6820 Y       .40469E+03  .80634E+03
6820 Z       .69344E+03 -.39026E+03  .15606E+04
6820 DX     -.17610E+01 -.17321E+00 -.26060E+01  .15618E-01
6820 DY     -.52524E+01 -.76136E+01  .23439E+01  .43912E-02  .79859E-01
6820 DZ     -.89767E+00  .65437E+00 -.31440E+01  .24655E-01 -.61675E-02  .45636E-01
6820 DRAG   -.17762E-02  .50442E-03 -.53197E-02 -.13125E-04 -.79211E-05 -.16935E-04  .16428E-06

CORRELATION MATRIX

6820 X      1.00000
6820 Y       .48066 1.00000
6820 Z       .59202 -.34789 1.00000
6820 DX     -.47525 -.04881 -.52785 1.00000
6820 DY     -.62687 -.94880  .20996  .12434 1.00000
6820 DZ     -.14020  .10671 -.36853  .91354 -.10106 1.00000
6820 DRAG   -.14780  .04383 -.33224 -.25912 -.06916 -.19348 1.00000

ENTER SEGMENT 84 AT     10.5 SECONDS.  EXECUTION TIME FOR SEGMENT 83 WAS      .0 CP SECS.
**** ORBITAL ELEMENTS FOR VEHICLE    1 FOR ITERATION   2. ****

 YEAR/MC/DY           X            ALPHA             A                AF          MEAN ANOMALY   APOGEE RADIUS
     HR/MIN           Y            DELTA             E                AG        ECCENTRC ANOM    APOGEE HEIGHT
    SECONDS           Z             BETA             I                 N         TRUE ANOMALY   PERIGEE RADIUS
   LATITUDE        XDOT          AZIMUTH             O                 L       KEPLERIAN PER    PERIGEE HEIGHT
  LONGITUDE        YDOT           RADIUS             U               CHI          ANOMALY PER            O-DOT
     HEIGHT        ZDOT         VELOCITY           TAU               PSI         NODAL PERIOD            U-DOT

 1970/ 6/26    7593443.067     43.409413599   21743146.308  .0107339327918     355.77927559       3648.44899
     17/44     7183125.774     60.640045934   .01955793658 -.0163491764330     355.63515102        212.70043
  1.3979200   16580800.199     90.084130607  108.875079899  .0670480122506     355.61020994       3508.47433
 60.8042163   24.94.6299573   221.286090669  185.982349502   299.065885031      89.-891116          72.73477
222.9719608   -772.3950101    21319094.951  117.304259930   -.1457775670S      89.6707338       2.8211594E19
   73.5309   -9591.9000579    25943.1793895    975.5843667  -1.3911931170 3     89.7028441      -2.0786362E54
                                TOTAL EDIT SUMMARY

 STA     N TYP   RMS    RMS/SIG     MEAN        N TYP   RMS    RMS/SIG    MEAN        N TYP   RMS    RMS/SIG     MEAN
 343     5 RNG 9.7E+02 4.9E+01   1.6E+02       5 AZ  4.4E-02 0.       -1.0E-02       5 EL  4.9E-02 0.        -4.7E-02
 343     5 SRR 1.1E+01 1.1E+02   9.5E+00

EXIT SEGMENT 84 AT    10.5 SECONDS.  EXECUTION TIME FOR SEGMENT 84 WAS      .0 CP SECS.
```

```
ENTER SEGMENT 10 AT    10.5 SECONDS.  EXECUTION TIME FOR SEGMENT 84 WAS      .1 CP SECS.

**********************************  TRAJECTORY INTEGRATION FOR CASE   1  **********************************

                                      * PREDETERMINED EVENT TABLE *
 TIME(MME)     TYPE        ASSOCIATED QUANTITIES
   1064.0233 TZERO
   1083.1645 TSTOP

         ***  TRAJECTORY START

         * * * * * * * * * * * * * * * * * * *   ECI  * * * * * * * * * * * * * * * * * * * *
SEG10 ENTRY TIME IS    10.57600
 *              STEP    DOUBLED          T  =  1067.273299     H  =       .250000     NSTEP  =        25
 *              STEP    DOUBLED          T  =  1071.523299     H  =       .500000     NSTEP  =        41
   NODE  T =      .108016365486E+04     .214420373113E+08     .225573039794E+07     -.303975478830E-02
        DT =      .500000000000E+00     .133527768483E+04    -.820457575669E+04     -.243064633952E+05

         ***  TRAJECTORY TERMINATION

         ***  THIS CASE TOOK       .214  SECONDS TO INTEGRATE A SPAN OF     19.5000  MINUTES  ***

             ***  FROM       1064.023  TO       1083.523  MINUTES FROM MIDNIGHT OF EPOCH  ***

ENTER SEGMENT 81 AT    10.8 SECONDS.  EXECUTION TIME FOR SEGMENT 10 WAS      .2 CP SECS.

ENTER SEGMENT 82 AT    10.9 SECONDS.  EXECUTION TIME FOR SEGMENT 81 WAS      .1 CP SECS.
```

```
****************************************************  STAGE  6  ****************************************************

STAPASS    YEAR MO DY HR MN  SEC                      RESIDUALS - EXTERNAL UNITS                                MME

343   18    1970  6 26 17 44 23.0000     .224450E+02 RNG  -.282965E-01 AZ    -.106395E-01 EL    1064.333
343   18    1970  6 26 17 44 19.2525     .527920E-01 SRR  0.                 0.                 1064.321
343   18    1970  6 26 17 44 40.0000     .157758E+02 RNG  -.104524E+00 AZ    -.186839E-01 EL    1064.667
343   18    1970  6 26 17 44 39.2512    -.334204E-01 SRR  0.                 0.                 1064.654
343   18    1970  6 26 17 45 56.0000    -.684252E+01 RNG  -.210743E-01 AZ    -.380046E-01 EL    1065.933
343   18    1970  6 26 17 45 55.2392     .457146E-01 SRR  0.                 0.                 1065.921
343   18    1970  6 26 17 46 36.0000    -.974236E+01 RNG   .154507E-01 AZ    -.504605E-01 EL    1066.600
343   18    1970  6 26 17 46 35.2336     .734993E-01 SRR  0.                 0.                 1066.587
343   18    1970  6 26 17 47 32.0000    -.472401E+01 RNG  -.461330E-01 AZ    -.567544E-01 EL    1067.533
343   18    1970  6 26 17 47 31.2318    -.582066E-01 SRR  0.                 0.                 1067.521

ENTER SEGMENT 83 AT     10.9 SECONDS.  EXECUTION TIME FOR SEGMENT 82 WAS      .0 CP SECS.

ITERATION NUMBER      2
   10 MEASUREMENTS WERE USED IN THIS SOLUTION
CURRENT SOLUTION IS

NAME                CURRENT VALUE          CORRECTION         NEW VALUE                TOTAL CORR.        SIGMA
6820     X           .759344306669130E+07  -.17473217E+00     .759344289195910E+07    .11505509E+04     .29652415E+02
6820     Y           .718312577439590E+07  -.76528587E+00     .718312500911090E+07   -.25935742E+01     .28380447E+02
6820     Z           .185808019900040E+08  -.22954129E+00     .185807999694630E+08   -.83665056E+03     .39509778E+02
6820     DX          .240946299573330E+05   .22630740E-02     .240946322294070E+05   -.20642312E+00     .12498010E+00
6820     DY         -.772395010086480E+03   .10204461E-02    -.772393989640380E+03   -.47199149E+00     .28259769E+00
6820     DZ         -.959190057883200E+04   .34716790E-02    -.959189658623410E+04   -.14273752E+01     .21595791E+00
6820     DRAG        .936012340800690E-02  -.76051947E-06     .935936288853780E-02    .14514927E-03     .40531414E-03

NAME                SIGMA ZERO         SIGMA DEWT         TOTAL CORR.        T.C./SIGMA0        T.C./SIGMAD
6820     X           .83935591E+03      .11234573E+04      .11505509E+04      .13707545E+01      .11241806E+01
6820     Y           .18197891E+03      .24845163E+03     -.25935742E+01     -.14252060E-01     -.10438948E-01
6820     Z           .41169345E+03      .50041317E+03     -.83665056E+03     -.20322176E+01     -.16719196E+01
6820     DX          .40583091E+00      .49220109E+00     -.20642312E+00     -.50864328E+00     -.41938777E+00
6820     DY          .40530958E+00      .48655137E+00     -.47199149E+00     -.11645202E+01     -.97035550E+00
6820     DZ          .90215315E+00      .10590583E+01     -.14273752E+01     -.15821873E+01     -.13477778E+01
6820     DRAG        .43152294E-03      .43152294E-03      .14514927E-03      .33636514E+00      .33636514E+00

RESIDUAL   RMS =     .6140155352E+00
RESIDUAL   SOS =     .3770157775E+01
APRIORI    RMS =     .6649403878E+00
APRIORI    SOS =     .3095021036E+01
TOTAL      SOS =     .6865170811E+01
PREDICTED  SOS =     .6855143009E+01
```

ATA

	6820 X	6820 Y	6820 Z	6820 DX	6820 DY	6820 DZ	6820 DRAG	
6820 X	.29198E-01							
6820 Y	-.44992E-02	.19864E-01						
6820 Z	-.13198E-01	.50833E-02	.12434E-01					
6820 DX	.47059E+01	-.17609E+00	.20929E+01	.43090E+04				
6820 DY	.14332E+01	.15533E+01	-.87924E+00	-.18967E+03	.29638E+03			
6820 DZ	-.25322E+01	.64200E+00	-.59786E+03	-.19687E+04	.82292E+02	.93680E+03		
6820 DRAG	.86061E+02	.13439E+03	.30760E+03	.25316E+06	-.10096E+05	-.10543E+06	.25438E+08	
ATB	.46266E-02	-.13627E-01	-.29084E-02	.18222E+01	-.10708E+01	-.93047E+00	-.11216E+02	.37792E+'1

ATA INVERSE

	6820 X	682^ Y	6820 Z	6820 DX	6820 DY	6820 DZ	682^ DRAG
6820 X	.87927E+03						
6820 Y	.40464E+03	.80545E+03					
6820 Z	.69369E+03	-.38972E+03	.15610E+04				
6820 DX	-.17610E+01	-.17305E+00	-.26069E+01	.15620E-01			
6820 DY	-.52532E+01	-.76^96E+01	.23425E+01	.43922E-02	.79861E-01		
6820 DZ	-.89736E+00	.65443E+00	-.31448E+01	.24657E-01	-.61666E-02	.46638E-01	
6820 DRAG	-.17784E-02	.50270E-03	-.53233E-02	-.13125E-04	-.79253E-05	-.16948E-04	.16428E-06

CORRELATION MATRIX

6820 X	1.00030						
6820 Y	.48083	1.00000					
6820 Z	.59210	-.34756	1.00000				
6820 DX	-.47519	-.04879	-.52793	1.00000			
6820 DY	-.62689	-.94880	.20980	.12436	1.00000		
6820 DZ	-.14013	.10678	-.36857	.91355	-.10104	1.00000	
6820 DRAG	-.14797	.04370	-.33242	-.2591	-.36919	-.19362	1.00000

ENTER SEGMENT 84 AT 10.9 SECONDS. EXECUTION TIME FOR SEGMENT 83 WAS .0 CP SECS.
**** ORBITAL ELEMENTS FOR VEHICLE 1 FOR ITERATION 3. ****

YEAR/MO/DY	X	ALPHA	A	AF	MEAN ANOMALY	APOGEE RADIUS
HR/MIN	Y	DELTA	E	AG	ECCENTRC ANOM	APOGEE HEIGHT
SECONDS	Z	BETA	I	N	TRUE ANOMALY	PERIGEE RADIUS
LATITUDE	XDOT	AZIMUTH	O	L	KEPLERIAN PER	PERIGEE HEIGHT
LONGITUDE	YDOT	RADIUS	U	CHI	ANOMALY PER	O-DOT
HEIGHT	ZDOT	VELOCITY	TAU	PSI	NODAL PERIOD	U-DOT
1970/ 6/26	7593442.892	43.409411209	21743146.599	.0107338089766	355.77973727	3648.44912
17/44	7183125.009	60.640047161	.019557961 63	-.0163492876864	355.69563177	212.71063
1.3979200	18580799.969	90.084121532	108.875078675	.0670480199052	355.61068986	3508.47429
60.8042175	24094.6322204	221.286989441	185.982347975	299.065864625	89.4881134	72.73489
222.9719584	-772.3939896	21319094.431	117.303779372	-.1457775267 0	89.6707356	2.8211591592
73.5308	-9591.8965862	25945.1801773	975.5842502	-1.3911930 8952	89.7028459	-2.0786364671

EXIT SEGMENT 84 AT 10.9 SECONDS. EXECUTION TIME FOR SEGMENT 84 WAS .0 CP SECS.

```
ENTER SEGMENT 10 AT     11.0 SECONDS.  EXECUTION TIME FOR SEGMENT 84 WAS      .0 CP SECS.

 *********************************** TRAJECTORY INTEGRATION FOR CASE   1  ***********************************

                                   * PREDETERMINED EVENT TABLE *
 TIME(MME)    TYPE        ASSOCIATED QUANTITIES
   1064.0233 TZERO
   1083.1645 TSTOP

         ***  TRAJECTORY START

         * * * * * * * * * * * * * * * * * * * *   ECI  * * * * * * * * * * * * * * * * * * * * *
SEG11 ENTRY TIME IS   10.98900
 *              STEP   DOUBLED          T  =  1067.273299     H  =      .250000     NSTEP  =       25
 *              STEP   DOUBLED          T  =  1071.523299     H  =      .500000     NSTEP  =       41
   NODE  T =     .108016365736E+04     .214420405147E+08    .225573006533E+07    -.303506639194E-02
        DT =     .500000000000E+00     .133527982041E+04   -.820457356845E+04    -.243964682024E+05

         ***  TRAJECTORY TERMINATION

         ***  THIS CASE TOOK       .213  SECONDS TO INTEGRATE A SPAN OF     19.5000  MINUTES  ***

             ***  FROM       1064.023  TO       1083.523  MINUTES FROM MIDNIGHT OF EPOCH  ***

ENTER SEGMENT 81 AT     11.2 SECONDS.  EXECUTION TIME FOR SEGMENT 10 WAS      .2 CP SECS.

ENTER SEGMENT 82 AT     11.3 SECONDS.  EXECUTION TIME FOR SEGMENT 81 WAS      .1 CP SECS.
```

** STAGE 6 **

STAPASS		YEAR	MO	DY	HR	MN	SEC	RESIDUALS - EXTERNAL UNITS						MME
343	18	1970	6	26	17	44	20.0000	.229047E+02	RNG	-.282855E-01	AZ	-.106324E-01	EL	1064.333
343	18	1970	6	26	17	44	19.2525	.561860E-01	SRR	0.		0.		1064.321
343	18	1970	6	26	17	44	40.0000	.163067E+02	RNG	-.104513E+00	AZ	-.106781E-01	EL	1064.667
343	18	1970	6	26	17	44	39.2512	-.297533E-01	SRR	0.		0.		1064.654
343	18	1970	6	26	17	45	56.0000	-.622021E+01	RNG	-.210811E-01	AZ	-.380096E-01	EL	1065.933
343	18	1970	6	26	17	45	55.2392	.419391E-01	SRR	0.		0.		1065.921
343	18	1970	6	26	17	46	36.0000	-.931889E+01	RNG	.154376E-01	AZ	-.504668E-01	EL	1066.600
343	18	1970	6	26	17	46	35.2336	.685414E-01	SRR	0.		0.		1066.587
343	18	1970	6	26	17	47	32.0000	-.450345E+01	RNG	-.461437E-01	AZ	-.567614E-01	EL	1067.533
343	18	1970	6	26	17	47	31.2308	-.606428E-01	SRR	0.		0.		1067.521

ENTER SEGMENT 83 AT 11.3 SECONDS. EXECUTION TIME FOR SEGMENT 82 WAS .0 CP SECS.

ITERATION NUMBER 3
10 MEASUREMENTS WERE USED IN THIS SOLUTION
CURRENT SOLUTION IS

NAME		CURRENT VALUE	CORRECTION	NEW VALUE	TOTAL CORR.	SIGMA
6820	X	.75934428919591E+07	.60785110E-05	.75934428919652E+07	.11503509E+04	.29652406E+02
6820	Y	.71831250091100E+07	.10559320E-03	.71831250092156E+07	-.25934686E+01	.28380447E+02
6820	Z	.18580799969463E+08	-.26003321E-03	.18580799969203E+08	-.83665082E+03	.39509776E+02
6820	DX	.24094632221407E+05	-.10117911E-05	.24094632219395E+05	-.20642413E+00	.12498007E+00
6820	DY	-.77239398914238E+03	-.85849487E-06	-.77239399049887E+03	-.47199235E+00	.28259768E+00
6820	DZ	-.95918965862041E+04	-.27485479E-05	-.95918965889527E+04	-.14273780E+01	.21595792E+00
6820	DRAG	.93593628885378E-02	.42636614E-09	.93593633149939E-02	.14514970E-03	.40531414E-03

NAME		SIGMA ZERO	SIGMA DENT	TOTAL CORR.	T.C./SIGMA0	T.C./SIGMAD
6820	X	.83935591E+03	.10234573E+04	.11505509E+04	.13707545E+01	.11241807E+01
6820	Y	.18197890E+03	.24845168E+03	-.25934686E+01	-.14251480E-01	-.10438523E-01
6820	Z	.41169340E+03	.50041317E+03	-.83665082E+03	-.20322182E+01	-.16719201E+01
6820	DX	.40583081E+00	.49220109E+00	-.20642413E+00	-.50864577E+00	-.41938962E+00
6820	DY	.40530984E+00	.48656132E+00	-.47199235E+00	-.11645223E+01	-.97005727E+00
6820	DZ	.90215315E+00	.10590583E+01	-.14273780E+01	-.15821903E+01	-.13477804E+01
6820	DRAG	.43152294E-03	.43152294E-03	.14514970E-03	.33636613E+0	.33636613E+00

RESIDUAL RMS = .6130680263E+00
RESIDUAL SOS = .3758524048E+01
APRIORI RMS = .6651072090E+00
APRIORI SOS = .3096573196E+01
TOTAL SOS = .6855097244E+01
PREDICTED SOS = .6855097243E+01

****** LEAST SQUARES PROCESS CONVERGED ******

ATA

	6820 X	6820 Y	6820 Z	6820 DX	6820 DY	6820 DZ	6820 DRAG	
6820 X	.29198E-01							
6820 Y	-.44992E-02	.19864E-01						
6820 Z	-.13198E-01	.50833E-02	.12434E-01					
6820 DX	.47059E+01	-.27679E+00	.20929E+01	.43090E+04				
6820 DY	.14332E+01	.15533E+01	-.87923E+00	-.18967E+03	.29638E+03			
6820 DZ	-.25322E+01	.64200E+00	-.59786E+00	-.19687E+04	.82292E+02	.93680E+03		
6820 DRAG	.86061E+02	.13439E+03	.30760E+03	.25316E+06	-.10096E+05	-.10543E+06	.25438E+08	
ATB	.41392E-05	-.15072E-05	-.23650E-05	.72438E-03	.10835E-03	-.49068E-03	-.12140E-01	.37585E+01

ATA INVERSE

	6820 X	6820 Y	6820 Z	6820 DX	6820 DY	6820 DZ	6820 DRAG
6820 X	.87927E+03						
6820 Y	.40464E+03	.80545E+03					
6820 Z	.69369E+03	-.38972E+03	.15610E+04				
6820 DX	-.17610E+01	-.17305E+00	-.26069E+01	.15620E-01			
6820 DY	-.52532E+01	-.76096E+01	.23425E+01	.43922E-02	.79861E-01		
6820 DZ	-.89735E+00	.65443E+00	-.31448E+01	.24657E-01	-.61666E-02	.46638E-01	
6820 DRAG	-.17784E-02	.30270E-03	-.53233E-02	-.13125E-04	-.79253E-05	-.16948E-04	.16428E-06

CORRELATION MATRIX

6820 X	1.00000						
6820 Y	.48083	1.00000					
6820 Z	.59210	-.34756	1.00000				
6820 DX	-.47519	-.04879	-.52793	1.00000			
6820 DY	-.62689	-.94880	.28980	.12436	1.00000		
6820 DZ	-.14013	.10676	-.36857	.91355	-.10104	1.00000	
6820 DRAG	-.14797	.04370	-.33242	-.25910	-.06919	-.19362	1.00000

ENTER SEGMENT 84 AT 11.3 SECONDS. EXECUTION TIME FOR SEGMENT 83 WAS .0 CP SECS.

ATA INVERSE UPDATED TO 1080.16 MINUTES FROM MIDNIGHT OF EPOCH

	6820 X	6820 Y	6820 Z	6820 DX	6820 DY	6820 DZ	6820 DRAG
6820 X	.35499E+05						
6820 Y	.10500E+05	.45207E+05					
6820 Z	.39262E+05	.54209E+04	.46872E+05				
6820 DX	.72910E+02	.31827E+02	.79375E+02	.15238E+00			
6820 DY	.17093E+02	.35478E+02	.15014E+02	.42516E-01	.30491E-01		
6820 DZ	.37517E+02	.63646E+01	.43562E+02	.76353E-01	.14678E-01	.42439E-01	
6820 DRAG	-.33922E-01	-.11780E-01	-.25810E-01	-.67130E-04	-.16543E-04	-.19563E-04	.16428E-06

G AND G DEWEIGHTING MATRICES FOR VEHICLE 6820

ORBIT PLANE COORDINATE SYSTEM

.43466E+04					
-.40126E+04	.40423E+04				
0.	0.	.41290E+04			
.99574E+01	-.86330E+01	0.	.25101E-01		
-.50857E+01	.46549E+01	0.	-.11651E-01	.59505E-02	
0.	0.	.49990E+01	0.	0.	.99104E-02

PARAMETER SET COORDINATE SYSTEM

.93055E-11					
.29501E-11	.10030E-10				
.86308E-11	.84679E-12	.92512E-11			
.12938E-11	.44673E-12	.11146E-11	.19853E-12		
.28967E-12	.75130E-12	.10441E-12	.43619E-13	.85921E-13	
.65715E-12	.56289E-13	.64756E-12	.91182E-13	-.42134E-15	.52310E-13

```
**** ORBITAL ELEMENTS FOR VEHICLE    1 FOR NEXT OATA STAGE ****
 YEAR/MO/OY            X             ALPHA             A               AF          MEAN ANOMALY    APOGEE RADIUS
     HR/MIN            Y             OELTA             E               AG        ECCENTRIC ANOM    APOGEE HEIGHT
    SECONDS            Z              BETA             I                N          TRUE ANOMALY   PERIGEE RADIUS
   LATITUDE         XDOT           AZIMUTH             O                L        KEPLERIAN PER    PERIGEE HEIGHT
  LONGITUDE         YDOT            RADIUS             U              CHI          ANOMALY PER            O-DOT
     HEIGHT         ZDOT          VELOCITY           TAU              PSI         NOOAL PERIOO            U-DOT

 1970/ 6/26     21442108.010      6.004383877    21794563.777   .0122834546163     58.51440816       3662.97539
    18/ 0        2255315.104     -.003266904     .02120243080 -.0172817768107     59.55167132        226.92318
  9.8700000        -1229.335    88.952610047   108.852063768   .0668108839665     60.63468846       3510.87238
  -.0032889     1333.7543378   198.852063799   186.005499332     3.908663117      89.3057269         74.82717
181.5205826    -8704.7343403    21560399.619   119.398763620    -.14627750850     89.5668466      2.7958204713
   104.4612   -24306.4601608    25688.5299652    1065.5699717  -1.3904537206B     89.6990060     -2.0671152148

LEAST SQUARES PROCESS CONVERGED.
                                   TOTAL EDIT SUMMARY

  STA     N TYP    RMS    RMS/SIG      MEAN       N TYP    RMS   RMS/SIG      MEAN       N TYP    RMS   RMS/SIG      MEAN
  343     5 RNG 1.4E+01  6.8E-01   3.8E+00        5 AZ  5.4E-02 0.          -3.7E-02      5 EL  3.9E-02 0.          -3.5E-02
  343     5 SRR 5.3E-02  5.3E-01   1.5E-02
```

```
TYPE  SYMB  MINIMUM          DELTA            MEAN             MAXIMUM          STATION 343   PAGE  1
 RNG   0     -.22439559E+02   .52546681E+00    .38337818E+01    .30107122E+02
 AZ    1     -.11550817E+ 0   .15718191E-02   -.36917213E-01    .41673742E-01
 EL    2     -.70484692E-01   .71150079E-03   -.34909652E-01    .66538697E-03
 SRR   3     -.86777491E- 1   .20406317E-02    .15254093E-01    .11728568E+00
63860 .*.........*.........*.........*.........*.........*...1.....*.........3.........*..2..0...*.........*
63870 .*                                                 *                                                 *
63880 .*      1                    3                     *                     2 0                         *
63890 .*                                                 *                                                 *
63900 .*                                                 *                                                 *
63910 .*                                                 *                                                 *
63920 .*                                                 *                                                 *
63930 .*                                                 *                                                 *
63940 .*                                                 *                                                 *
63950 .*                                                 *                                                 *
63960 .*                              0              2   *        1   3                                    *
63970 .*                                                 *                                                 *
63980 .*                                                 *                                                 *
63990 .*                                                 *                                                 *
64000 .*                        0  2                     *                         3      1                *
64010 .*                                                 *                                                 *
64020 .*                                                 *                                                 *
64030 .*                                                 *                                                 *
64040 .*                                                 *                                                 *
64050 .*            3     2              0         1     *                                                 *
       ********************************************* END OF PLOT *******************************************
EXIT SEGMENT 84 AT     11.4 SECONDS.  EXECUTION TIME FOR SEGMENT 84 WAS      .1 CP SECS.
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```
ENTER SEGMENT 10 AT     11.4 SECONDS.  EXECUTION TIME FOR SEGMENT 84 WAS      .1 CP SECS.
 *********************************** TRAJECTORY INTEGRATION FOR CASE    1  ***********************************

                                        * PREDETERMINED EVENT TABLE *
 TIME(MME)      TYPE        ASSOCIATED QUANTITIES
   1864.0233 TZERO
   1800.4973 TSTOP

         ***   TRAJECTORY START

         * * * * * * * * * * * * * * * * * * * *   ECI  * * * * * * * * * * * * * * * * * * * * *
SEG11 ENTRY TIME IS     11.44500
 *              STEP    DOUBLED           T   =   1067.273299       H   =        .250000       NSTEP   =        25
 *              STEP    DOUBLED           T   =   1071.523299       H   =        .500000       NSTEP   =        41
   NODE   T =    .10801636570 6E+04    .214420405147E+08    .225573006533E+07    -.302834997348E-02
         DT =    .50000000000 00E+00   .133527982039E+04   -.820457386845E+04    -.243064602024E+05
 *              STEP    DOUBLED           T   =   1099.023299       H   =       1.000000       NSTEP   =        95
   NODE   T =    .11260660041 1E+04   -.218610693671E+08   -.233331033150E+07    -.113569520133E-01
         DT =    .10000000000 00E+01  -.396555160884E+03    .814287966114E+04     .238361856031E+05
   NODE   T =    .11698597193 8E+04    .214353907077E+08    .232104421883E+07    -.116027430591E+00
         DT =    .10000000000 00E+01   .136012302726E+04   -.820007391091E+04    -.243054003159E+05
   NODE   T =    .12157574189 0E+04   -.218507760784E+08   -.239954949100E+07     .449425186410E-02
         DT =    .10000000000 00E+01  -.421652153901E+03    .814208078449E+04     .238388596710E+05
   NODE   T =    .12595484267 6E+04    .214287470693E+08    .238591508462E+07    -.168020966610E+00
         DT =    .10000000000 00E+01   .138387961519E+04   -.819502895014E+04    -.243043112346E+05
   NODE   T =    .13054397824 E+04    -.218402598802E+08   -.246510553981E+07    -.179400456070E+00
         DT =    .10000000000 00E+01  -.447234823581E+03    .814142907676E+04     .238415978844E+05
   NODE   T =    .13492291867 3E+04    .214216117478E+08    .245143920516E+07     .233712681070E-01
         DT =    .10000000000 00E+01   .140734666221E+04   -.819029397584E+04    -.243033419389E+05
   NODE   T =    .13951122990 8E+04   -.218295752978E+08   -.253151835767E+07    -.415919552178E-01
         DT =    .10000000000 00E+01  -.473470711191E+03    .814029471625E+04     .238444586609E+05
   NODE   T =    .14388992926 1E+04    .214141868977E+08    .251746397605E+07    -.782375450684E-01
         DT =    .10000000000 00E+01   .143219402548E+04   -.818515918341E+04    -.243022270766E+05
   NODE   T =    .14847777605 4E+04   -.218187587642E+08   -.259849755109E+07     .114598971397E-01
         DT =    .10000000000 00E+01  -.499017620021E+03    .813889361458E+04     .238470651492E+05
   NODE   T =    .15285620016 0E+04    .214068712948E+08    .258295234820E+07    -.175603228512E+00
         DT =    .10000000000 00E+01   .145685763952E+04   -.817983928043E+04    -.243009756176E+05
   NODE   T =    .15744355464 8E+04   -.218074960176E+08   -.266463922821E+07    -.180128986515E+00
         DT =    .10000000000 00E+01  -.524136099269E+03    .813824973796E+04     .238498592982E+05
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```
NODE  T =   .161821685088E+04    .213994367270E+08    .264828399292E+07    .243835445813E-01
     DT =   .100000000000E+01    .148089881692E+04   -.817555587226E+04   -.242995496028E+05
NODE  T =   .166408354981E+04   -.217958962602E+08   -.273074355062E+07   -.212157618508E-01
     DT =   .100000000000E+01   -.550046114581E+03    .813782797751E+04    .238527373047E+05
NODE  T =   .170786150670E+04    .213915999808E+08    .271350556792E+07   -.114127474058E+00
     DT =   .100000000000E+01    .150524649161E+04   -.817124063287E+04   -.242982391742E+05
NODE  T =   .175372245239E+04   -.217843490327E+08   -.279665859553E+07   -.932234178636E-02
     DT =   .100000000000E+01   -.575642917481E+03    .813756447812E+04    .238552246979E+05
NODE  T =   .179749767323E+04    .213834988072E+08    .277846378426E+07   -.131203734526E+00
     DT =   .100000000000E+01    .152916060097E+04   -.816674010473E+04   -.242971469914E+05

     ***  TRAJECTORY TERMINATION

     ***  THIS CASE TOOK      .872  SECONDS TO INTEGRATE A SPAN OF    737.0000  MINUTES  ***

          ***  FROM      1064.023  TO      1801.023  MINUTES FROM MIDNIGHT OF EPOCH  ***

ENTER SEGMENT 50 AT    12.3 SECONDS. EXECUTION TIME FOR SEGMENT  19 WAS     .9 CP SECS
                                   *** TRACE66 EPHEMERIS OUTPUT KEY ***

 DATE,...    ME,MM,ST,OT         X,XO           X,XD - BF      ADBARV           LAT,...          REV,...    REMARK

 YR/MO/DAY   MIN FROM EPOCH      X (FT)         X (FT)         ALPHA   (DEG)    LATITUDE (DEG)   REV COUNT      .
 HR/MIN      MIN FROM MIDNIGHT   Y (FT)         Y (FT)         DELTA   (DEG)    LONGITUDE(DEG)   PERIOD         .
 SEC         SEC FROM MIDNIGHT   Z (FT)         Z (FT)         BETA    (DEG)    ALTITUDE (NM)    PERIOD-DECAY   .
             STEP SIZE(MIN)      XD(FT/SEC)     XD(FT/SEC)     AZIMUTH(DEG)     S-VEH-LAT(DEG)   NDD-REG        .
 IT          UTC - IT            YD(FT/SEC)     YD(FT/SEC)     R       (FT)     I        (DEG)
             UT1 - IT            ZD(FT/SEC)     ZD(FT/SEC)     V   (FT/SEC)     O        (DEG)

                                  * * *      ECI  TRAJECTORY      * * *
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*** CASE     1
***


*** EPOCH PRINT

DATE,...   ME,MM,ST,DT,..        X,XD              X,XD - BF         ADBARV           LAT,.. BF       REV,...
70/ 6/26        0.00000    .759344289E+07    -.764806414E+07     43.40941121      60.80421747      .31365
 17/44       1064.02330    .718312501E+07    -.712494034E+07     60.64004716     222.97195840     0.00000
 1.39792    63841.39792    .185808000E+08     .185808000E+06     90.08412153      73.53012355     0.00000
                 .12500    .240946322E+05    -.246075916E+05    221.28608944      60.80078890     0.00000
IT              0.00000    -.772393990E+03    .151403765E+04    .21319994E+08    108.87507868
                0.00000    -.959189659E+04   -.959189659E+04    .25945180E+05      5.54459517

  A   =   .21743147E+08    MEAN ANOM  =   .35577974E+03    APOGEE  =   .36464491E+04
  E   =   .19557962E-01    ECCENTRIC  =   .35569563E+03    HEIGHT  =   .21270963E+03
  I   =   .10887508E+03    TRUE ANOM  =   .35561069E+03    PERIGEE =   .35084743E+04
  O   =   .18598235E+03    KEPL PER   =   .89488113E+02    HEIGHT  =   .72734801E+02
  U   =   .11730378E+03    ANOM PER   =   .89670736E+02    O-DOT   =   .28211592E+01
 TAU  =   .97558425E+03    NODL PER   =   .89702846E+02    U-DOT   =  -.20786365E+01

***   REQUESTED PRINTS

DATE,...   ME,MM,ST,DT,..        X,XD              X,XD - BF         ADBARV           LAT,.. BF       REV,...
70/ 6/26       16.14036    .214420405E+08    -.215527613E+08      6.00549935        .00000006      .50000 DSC NODE
 18/ 3       1080.16366    .225573007E+07    -.572626326E+06       .00000006      181.52190964     0.00000
 9.81942    64809.81942    .230045380E-01     .230045380E-01     88.95264149     104.45724719     0.00000
                 .50000    .133527985E+04    -.731569387E+03    198.85206376        .00000006     0.00000
IT              0.00000    -.820457386E+04    .985550169E+04    .21560367E+08    108.84336396
                1.00000    -.243064602E+05   -.243064602E+05    .25688558E+05      1.52190962

 DELTA NODE =     -.052    DELTA V =      -.0009

DATE,...   ME,MM,ST,DT,..        X,XD              X,XD - BF         ADBARV           LAT,.. BF       REV,...
70/ 6/26      105.83642    .143539086E+08    -.201569485E+08      6.17996209       -.00000288     1.50000 DSC NODE
 19/29       1169.85972    .232104389E+07     .765249304E+07     -.00000205      159.21096388     0.00000
51.58320    70191.58320    -.107809356E+01   -.107809356E+01     88.95279037     104.50992605     0.00000
                1.00000    .136012187E+04     .306461904E+04    198.85196623       -.00000288     0.00000
IT              0.00000    -.820007404E+04    .939502721E+04    .21560687E+08    108.85222696
                 .00000    -.243054003E+05   -.243054003E+05    .25687422E+05    339.21096435
```

DELTA NODE = -.068 DELTA V = -.0011

DATE,...	ME,MM,ST,DT,..	X,XD	X,XD - BF	ADBARV	LAT,.. BF	REV,...
70/ 6/26	195.52513	.214287473E+08	-.157433235E+08	6.35324341	-.00001173	2.50000 DSC NODE
20/59	1259.54843	.238591366E+07	.147319911E+08	-.00001165	136.90068010	89.69142
32.90578	75572.90578	-.438376636E+01	-.438376636E+01	88.95481801	104.58844613	0.00000
	1.00000	.138387453E+04	.640178899E+04	198.85063321	-.00001173	.17450
IT	0.00000	-.819502954E+04	.752698666E+04	.21561164E+08	108.84808891	
	0.00000	-.243043113E+05	-.243043113E+05	.25686050E+05	316.90068497	

DELTA NODE = -.092 DELTA V = -.0015

DATE,...	ME,MM,ST,DT,..	X,XD	X,XD - BF	ADBARV	LAT,.. BF	REV,...
70/ 6/26	285.20589	.214216120E+08	-.897364123E+07	6.52839148	-.00001158	3.50000 DSC NODE
22/29	1349.22919	.245143774E+07	.196053251E+08	-.00001150	114.59425589	89.68236
13.75138	80953.75138	-.432756937E+01	-.432756937E+01	88.95815109	104.63123814	-.00905
	1.00000	.140734137E+04	.877973059E+04	198.84997498	-.00001157	.17289
IT	0.00000	-.819029459E+04	.453222152E+04	.21561424E+08	108.84274223	
	0.00000	-.243033420E+05	-.243033420E+05	.25684898E+05	294.59425981	

DELTA NODE = -.107 DELTA V = -.0018

DATE,...	ME,MM,ST,DT,..	X,XD	X,XD - BF	ADBARV	LAT,.. BF	REV,...
70/ 6/26	374.87599	.214141869E+08	-.862266509E+06	6.70494801	-.00000271	4.50000 DSC NODE
23/58	1438.89929	.251746366E+07	.215444081E+08	-.00000269	92.29191156	89.67252
53.95759	86333.95759	-.101202333E+01	-.101202333E+01	88.95875949	104.66947350	-.00984
	1.00000	.143219283E+04	.984213692E+04	198.84909180	-.00000271	.17519
IT	0.00000	-.818515932E+04	.861009873E+03	.21561656E+08	108.83250828	
	0.00000	-.243022270E+05	-.243022270E+05	.25683579E+05	272.29191248	

DELTA NODE = -.109 DELTA V = -.0018

DATE,...	ME,MM,ST,DT,..	X,XD	X,XD - BF	ADBARV	LAT,.. BF	REV,...
70/ 6/27	464.53870	.214068712E+08	.737823384E+07	6.88004863	.00000451	5.50000 DSC NODE
1/28	1528.56200	.258295298E+07	.202604898E+08	.00000448	69.98936552	89.66046
33.72002	5313.72002	.168762171E+01	.168762171E+01	88.95920725	104.74867934	-.00706
	1.00000	.145685981E+04	.943171991E+04	198.84799115	.00000451	.17674
IT	0.00000	-.817983000E+04	-.293826764E+04	.21562139E+08	108.81834109	
	0.00000	-.243009755E+05	-.243009755E+05	.25682085E+05	249.98996398	

```
DELTA NODE =      -.102   DELTA V =      -.0017

DATE,...  ME,MM,ST,DT,..        X,XD              X,XD - BF          ADBARV          LAT,.. BF        REV,...
70/ 6/27       554.19355   .213994367E+08   .145148497E+08       7.05476158       .00010215      6.50000 DSC NODE
  2/58        1618.21685   .264828417E+07   .159457968E+08        .00000214     47.68950143     89.65779
13.01102     10693.01102   .804616523E+00   .804616523E+00      88.96119198    104.83843728      -.00767
                 1.00000   .148089974E+04   .761081880E+04     198.84921886       .00000215       .17476
IT               0.00000  -.817555575E+04  -.629825321E+04   .215626835E+08    108.80199001
                 0.00000  -.242995496E+05  -.242995496E+05   .256807496E+05    227.68960070

DELTA NODE =      -.082   DELTA V =      -.0014

DATE,...  ME,MM,ST,DT,..        X,XD              X,XD - BF          ADBARV          LAT,.. BF        REV,...
70/ 6/27       643.83821   .213916000E+08   .194799850E+08       7.22939829      -.00000283      7.50000 DSC NODE
  4/27        1707.86151   .271350525E+07   .924628832E+07      -.00000281     25.39162634     89.64801
51.69044     16071.69044  -.105712610E+01  -.105712610E+01      88.96243023    104.89325314      -.00978
                 1.00000   .150524536E+04   .465155802E+04     198.85050759      -.00000283       .17482
IT               0.00000  -.817124078E+04  -.871542997E+04   .215630165E+08    108.85076564
                 0.00000  -.242982392E+05  -.242982392E+05   .256799552E+05    205.39162729

DELTA NODE =      -.050   DELTA V =      -.0008

DATE,...  ME,MM,ST,DT,..        X,XD              X,XD - BF          ADBARV          LAT,.. BF        REV,...
70/ 6/27       733.47438   .213834991E+08   .215317973E+08       7.40324268      -.00001245      8.50000 DSC NODE
  5/57        1797.49768   .277846226E+07   .116429879E+07      -.00001237      3.09516673     89.63890
29.86058     21449.86058  -.465457882E+01  -.465457882E+01      88.96437666    104.93226575      -.00910
                 1.00000   .152915515E+04   .996256937E+03     198.85127777      -.00001245       .17436
IT               0.00000  -.816674083E+04  -.982865865E+04   .215632535E+08    108.84890896
                 0.00000  -.242971470E+05  -.242971470E+05   .256789499E+05    183.09517095

DELTA NODE =       .025   DELTA V =    -89.6236

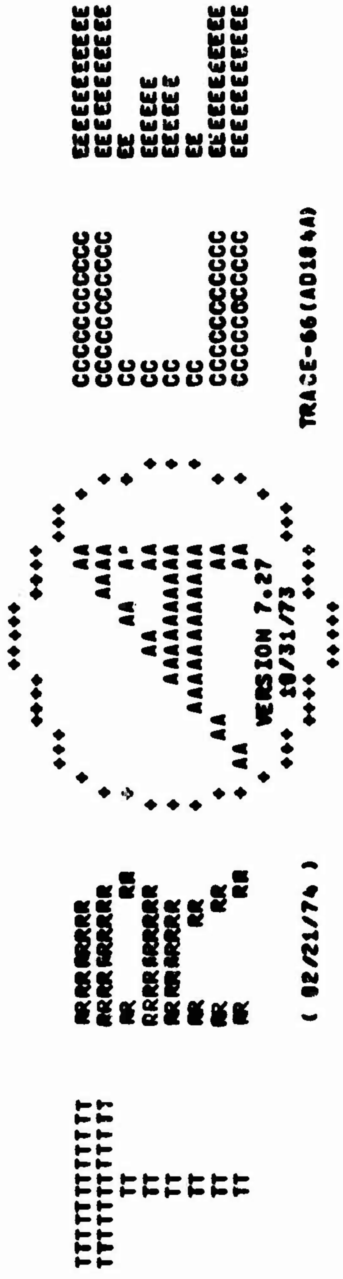

      **   TRAJECTORY TERMINATION


  A  =   .21780897E+08     MEAN ANOM  =   .69888710E+02    APOGEE   =   .36578764E+04
  E  =   .29420730E-01     ECCENTRIC  =   .70994953E+02    HEIGHT   =   .22200649E+03
  I  =   .10689225E+03     TRUE ANOM  =   .72104969E+02    PERIGEE  =   .35114730E+04
  O  =   .18740337E+03     KEPL PER   =   .89721271E+02    HEIGHT   =   .75603138E+02
  U  =   .11819828E+03     ANOM PER   =   .89595851E+02    O-DCT    =   .28010077E+01
TAU  =   .17826052E+04     NODL PER   =   .89628018E+02    U-DCT    =  -.20714803E+01

      ***  END OF TRAJECTORY  ***

EXIT SEGMENT 50 AT    12.6 SECONDS.  EXECUTION TIME FOR SEGMENT 50 WAS      .2 CP SECS.
```

C. 8 TEST CASE G: ECI SIMULTANEOUS-VEHICLE DATA GENERATION RUN (ITIN = 4)



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C-306

```
MODEL DATA
DITIN 4                    IMULTV2                    LEMSP1                    CARD  1
END                                                                             CARD  2

******************************* GENERAL PERTURBATIONS GRAVITY MODEL ******************************

GM =  .5530417744E-02 ER**3/MIN**2  =  .1407660055E+17 FT**3/SEC**2  =  .3986049304E+15 M**3/SEC**2

                    **** ZONAL HARMCNICS ****

EJ2 =  .1082549000E-02      EJ3 =-.2435000000E-05      EJ4 = -.1232000000E-05

******************************************* PHYSICAL CONSTANTS *******************************************

GM(ER**3/MIN**2)    =  .553039350E-02    OMEGE(RAD/MIN) =  .437526910E-02  GMLAT(DEG)   =  .783000000E+02
GMKM(KM**3/SEC**2)  = 0.                 OMEGA(RAD/MIN) =  .437526910E-02  GMLNG(DEG)   =  .291000000E+03
SGM(ER**3/MIN**2)   =  .680232650E-04    OMEGL(RAD/MIN) = 0.               AM(ER)       =  .272506277E+00
ERFT(FT/ER)         =  .209257380E+08    ERKM(KM/ER)    =  .637816490E+04  ERNM(NM/ER)  =  .344393360E+04
FTKM(FT/KM)         =  .328083990E+04    FTNM(FT/NM)    =  .607611550E+04  AE(ER)       =  .100000000E+01
GSUB0(FT/SEC**2)    =  .321740000E+02    DGREE(DEG)     =  .572957795E+02  SLT(ER/MIN)  =  .282017630E+04
CKEP                =  .100000000E-10    F              =  .335232987E-02  PI           =  .314159265E+01

******************************************* INPUT/OUTPUT CONVERSION FACTORS *******************************

DF(I/O-ER) =  .20925738E+08  VF(I/O-ER/MIN) =  .34876230E+06  AF(I/O-ER/MIN**2) =  .58127050E+04

******************************************* INTEGRATION INPUTS *******************************************

                           ICENT =   1               NSTEP =   2
 NPCMP =   0               IR    =   8               ER    =  .10000000E-09
 HMIN  =  .15625000E-01    HMAX  =  .64000000E+02    HO    =  .10000000E+01

******************************************* SPECIAL OPTIONS *******************************************

 TAPE2  =   0    TAPE7  =   0    TELEM  =   0    PTAPE  =   0    NPDOT  =   0
 PRHO   =   0    NODPR  =   0    CLASS  =   0    LEMSP  =   1    PTNS   =10000
```

①

ITEM	DESCRIPTION	REFERENCE SECTION
1	Card images of the input MODEL data:	
	ITIN	2.1
	MULTV	2.1.4
	LEMSP	2.1.4

```
*************************************** CRASH ALTITUDE TABLE ********************************************
                                                (IN FT)

  ECI CRASH ALTITUDE =     .300000000E+06            MCI CRASH ALTITUDE =    .300000000E+04

******************************** INTERPLANETARY CRASH ALTITUDES TABLE *************************************
                                                  (IN FT)

  BODY(1) CRASH ALTITUDE =     .300000000E+06          BODY(2) CRASH ALTITUDE =    0.
  BODY(3) CRASH ALTITUDE =     .300000000E+04          BODY(4) CRASH ALTITUDE =    0.
  BODY(5) CRASH ALTITUDE =   0.                        BODY(6) CRASH ALTITUDE =    0.
  BODY(7) CRASH ALTITUDE =   0.

****************************************** STATION LOCATIONS ********************************************
STATION     SIG  REF  RA-RBF  DATUM  TYPE        LATITUDE          LONGITUDE          HEIGHT          P    Q
                                                     X                  Y                  Z
                                                  RADIUS            LATITUDE          LONGITUDE

  VTS       -0    1     1      -0     -0       .34700000E+02    -.12050000E+03 -0.
  AND       -0    1     1      -0     -0       .38800000E+02    -.75800000E+02 -0.
  DUM       -0   -0    -0      -0     -0     -0.                -0.                -0.

ENTER SEGMENT 01 AT       .2 SECONDS. EXECUTION TIME FOR SEGMENT  0 WAS      .2 CP SECS.

*************************************** VEHICLE DATA FOR CASE  1 ****************************************

      IVEHID1                 IBTAPE3                IICTYP2                     CARD   1
      IYEAR -1973             IMNTH 1                IDAY  1                     CARD   2
       IC    -96.7506126           3.73445133             88.2988214             CARD   3
             86.6729057            134623991.             18361.7713             CARD   4
       PTIM 0                      1                      0                      CARD   5
            0                      240                                           CARD   6
      END                                                                        CARD   7
```

(2)

(3)

ITEM	DESCRIPTION	REFERENCE SECTION
2	Printout of station locations as input. If CLASS $\neq 0$, the actual locations are left blank. This example has a "dummy" station DUM, which is used to illustrate Data Set Types A and R	4 Item 4
3	Card images of input VEHICLE data. Emphasis is on the variable associated with simultaneous-vehicle data generation (ITIN=4), the others having been discussed earlier:	
	BTAPE	11.4

```
   EPOCH                                        INITIAL  CONDITIONS
  YR/MO/DAY         X,Y,Z,DX,DY,DZ       A,D,B,A,R,V          A,E,I,O,U,TAU        AF,AG,N,L,CHI,PSI
TZNE,HR,MIN,SEC   -.15791181158E+08    -.96758612600E+02     .13833420868E+09    -.33262674454E-01
-1973/ 1/ 1       -.13340679577E+09     .37344513300E+01     .40008229570E-01    -.22217399798E-01
 0.                .87683745275E+07     .88298821400E+02     .49999999902E+01     .41768749493E-02
 0.                .10236583861E+05     .86672905700E+02     .21500001307E+03     .25993356923E+03
 0.               -.14813643214E+04     .13462399100E+09     .35874044867E+03    -.25042896151E-01
 0.                .61985084768E+03     .10361771300E+05    -.18426790668E+03    -.35764944855E-01

NO PLANETARY PERTURBATIONS.

 ** NO ATMOSPHERE MODEL **

***************************************** VEHICLE DATA FOR CASE  2 ****************************************

    IVEHID3                                                                              CARD   1
     IC    280.619783              22.9501321               77.0381996                   CARD   2
           72.448793               166569812.               8201.03766                   CARD   3
    END                                                                                  CARD   4

   EPOCH                                        INITIAL  CONDITIONS
  YR/MO/DAY         X,Y,Z,DX,DY,DZ       A,D,B,A,R,V          A,E,I,O,U,TAU        AF,AG,N,L,CHI,PSI
TZNE,HR,MIN,SEC    .28267416204E+08     .28061978300E+03     .13833121861E+09    -.22858036562E+00
-1973/ 1/ 1       -.15075769770E+09     .22950132100E+02     .29981105851E+00     .19400434856E+00
 0.                .64950535290E+08     .77038199600E+02     .28600684287E+02     .41782100534E-02
 0.                .76284083965E+04     .72448793000E+02     .22966614029E+03     .26000965736E+03
 0.                .66307942090E+03     .16656981200E+09     .27001139933E+03    -.19430910442E+00
 0.                .29365812037E+04     .82010376600E+04    -.47999867647E+03    -.16498361915E+00

NO PLANETARY PERTURBATIONS.

 ** NO ATMOSPHERE MODEL **

***************************************** VEHICLE DATA FOR CASE  3 ****************************************

    IVEHID2                                                                              CARD   1
     IC    -100.                   -28.6                    90.                          CARD   2
           90.                     96853470.                13744.772                    CARD   3
    END                                                                                  CARD   4
```


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```
   DATA GENERATION I
STATION  INTERVAL  MIN.ELE.  MAX.ELE.   MAX.RANGE      START TIME          STOP TIME      AZIMUTH1  AZIMUTH2
          (SEC.)   (DEG.)    (DEG.)     (N.MI.)      DA   HR    MIN     DA   HR   MIN     (DEG.)    (DEG.)
  VTS     900.00    -0.00     -0.00     -0.         -0. -0. 15.0000   -0.  4. -0.0000     -0.0      -0.0
  AND     900.00    -0.00     -0.00     -0.         -0. -0. 15.0000   -0.  4. -0.0000     -0.0      -0.0
  DUM     900.00    -0.00     -0.00     -0.         -0. -0. 15.0000   -0.  4. -0.0000     -0.0      -0.0

   DATA GENERATION II

 * SIMULTANEOUS VEHICLE DATA GENERATION II KEY/HEADER      *

 * STA    -- PRIMARY STATION ID
 * STA 2  -- SECOND  STATION ID
 * STA 3  -- THIRD   STATION ID
 * T      -- OBSERVATION DATA SET TYPE - 1 7  J   K   L   M   N   O   P    Q   R   S  T  U
 * O1     -- OBSERVATION 1-------------- R RD V2  S2  S3  S3D V3  V3D TDOA TOA 3WR MP R2 A
 * O2     -- OBSERVATION 2-------------- A    V2D S2D                             RC E
 * O3     -- OBSERVATION 3-------------- E                                        RL TOP
 * V1     -- VEHICLE 1 ID NUMBER
 * V2     -- VEHICLE 2 ID NUMBER
 * V3     -- VEHICLE 3 ID NUMBER

STA T 000   V1   V2   V3 STA T 000   V1   V2   V3 STA T 000   V1   V2   V3 STA T 000   V1   V2   V3 STA
      123                  2   123                2/3   123                2/3   123                2/3

VTS 1 XXX   1                1 XX    3                1 X    2
AND 7 X     1
DUM J XX    1    2           J X     2    3           J X    1    3
VTS K XX    2    3           K X     1    3           K X    1    2
AND L X     2    1    3      L X     1    2    3
VTS L X     2    3    1      L X     3    2    1
AND M X     2    3    1      M X     3    2    1
VTS M X     2    1    3      M X     1    2    3
DUM N X     1    3    2      O X     1    3    2
AND P X     2    3           P X     2    1
VTS Q X     1         AND    Q X     2        AND Q X    3        AND
AND R X     1         VTS    R X     2        VTS R X    3        VTS
DUM S X     1    3           S X     1    2
**************************************************************************************************
```

ITEM	DESCRIPTION	REFERENCE SECTION
4	<u>Simultaneous-vehicle DATA GENERATION II key/header printout</u>	12.2.2
	The observation names are abbreviated as follows for each data set type:	15.1

1	R	Station-vehicle range	Q	TOA	Time difference of arrival of signal transmitted from vehicle to Station 1 minus vehicle to Station 2
	A[a]	Station-vehicle azimuth			
	E[a]	Station-vehicle elevation			
7	RD	Station-vehicle range rate	R	3WR	Time of signal transmitted from Station 1 to Vehicle 1 plus time from Vehicle 1 to Station 2
J	V2	Vehicle-vehicle range			
	V2D	Vehicle-vehicle range rate			
K	S2	Station-vehicle-vehicle range sum	S	MP	Time from Vehicle 1 to earth to Vehicle 2 minus time from Vehicle 1 to Vehicle 2
	S2D	Station-vehicle-vehicle range rate sum			
L	S3	Station-vehicle-vehicle-vehicle range sum	T	R2	Two-way range
M	S3D	Station-vehicle-vehicle-vehicle range rate sum		RC	C-band range currently not used
				RL	L-band range
N	V3	Vehicle-vehicle-vehicle range sum	U	A[b]	Vehicle-vehicle azimuth
O	V3D	Vehicle-vehicle-vehicle range rate sum		E[b]	Vehicle-vehicle elevation
P	TDOA	Time difference of arrival of two signals. Time from station to Vehicle 1 minus station to Vehicle 2 to Vehicle 1		TOP[b]	Topocentric

[a]Observation output for Data Set Type 1.

[b]Observation output for Data Set Type U. If TOP is entered, A and E contain vehicle-vehicle topocentric right ascension and declination.

Consider the following segments of DATA GENERATION II printout:

a

	STA	T	O 1	O 2	O 3	V 1	V 2	V 3	STA 2
1	VTS	1	X	X	X	1			
2	AND	7	X			1			
3	DUM	J	X	X		1	2		
4	VTS	K	X	X		2	3		
5	AND	L	X			2	1	3	
6	AND	M	X			2	3	1	
7	DUM	N	X			1	3	2	
8	AND	P	X			2	3		
9	VTS	Q	X			1			AND
10	AND	R	X			1			VTS
11	DUM	S	X			1	3		

b

	T	O 1	O 2	O 3	V 1	V 2	V 3	STA 2
1	1		X	X	3			
2								
3	J	X			2	3		
4	K	X			1	3		
5	L	X			1	2	3	
6	M	X			3	2	1	
7	O	X			1	3	2	
8	P	X			2	1		
9	Q	X			2			AND
10	R	X			2			VTS
11	S	X			1	2		

c

	T	O 1	O 2	O 3	V 1	V 2	V 3	STA 2
1	1	X			2			
3	J		X		1	3		
4	K		X		1	2		
9	Q	X			3			AND
10	R	X			3			VTS

d

T	O 1	O 2	O 3	V 1	V 2	V 3	STA 2

1a Station-vehicle R, A, E data generated between Station VTS and Vehicle 1 (ID No. 1).

1b Station-vehicle A, E data generated between Station VTS and Vehicle 1 (ID No. 3).

1c Station-vehicle R data generated between Station VTS and Vehicle 1 (ID No. 2).

2a Station-vehicle range rate data generated between Station AND and Vehicle 1 (ID No. 1).

3a Vehicle-vehicle range and range rate data generated between Vehicle 1 (ID No. 1) and Vehicle 2 (ID No. 2).

7a Vehicle-vehicle-vehicle range data generated between Vehicle 1 (ID No. 1), Vehicle 2 (ID No. 3), and Vehicle 3 (ID No. 2)

9a Time-of-arrival data generated between Vehicle 1 (ID No. 1) to Station VTS minus Vehicle 1 (ID No. 1) and Station AND.

9b Time-of-arrival data generated between Vehicle 1 (ID No. 2) to Station VTS minus Vehicle 1 (ID No. 2) and Station AND.

```
     EPOCH                                      INITIAL  CONDITIONS
   YR/MO/DAY         X,Y,Z,DX,DY,DZ       [illegible],O,B,A,R,V         A,E,I,∩,∪,TAU         AF,AG,N,L,CHI,PSI
TZNE,HR,MIN,SEC     -.14766293955E+08    .10000000000E+03     .13[illegible]3313361E+09     -.5206900[illegible]54E-01
-1973/ 1/ 1         -.83743814448E+08    .28600000000E+02     .29955342290E+00     -.29529797564E+00
 0.                 -.46362967502E+08    .90000000000E+02     .28600000000E+02      .41781232924E-02
 0.                  .13535958029E+05    .90000000000E+02     .35000000000E+03      .26000000000E+03
 0.                 -.23867546102E+04    .36853470000E+08     .27000000000E+03     -.44262365465E-01
 0.                 -.48498647259E-10    .13744772000E+05    -.14360514470E+04      .25102434855E+00

NO PLANETARY PERTURBATIONS.

 ** NO ATMOSPHERE MODEL **

*****************************************************************************************************

ENTER SEGMENT 02 AT       .4 SECONDS.  EXECUTION TIME FOR SEGMENT  1 WAS      .1 CP SECS.
ENTER SEGMENT 10 AT       .4 SECONDS.  EXECUTION TIME FOR SEGMENT  2 WAS      .0 CP SECS.
```

```
********************************** TRAJECTORY INTEGRATION FCR CASE   1 ***********************************

        *** TRAJECTORY START

            * * * * * * * * * * * * * * * * * * *   ECI * * * * * * * * * * * * * * * * * * * *
SEG11 ENTRY TIME IS     .41100

        *** TRAJECTORY TERMINATION

        *** THIS CASE TOCK       .067  SECONDS TO INTEGRATE A SPAN OF    247.0000  MINUTES ***

            *** FROM          0.000  TO        247.000  MINUTES FROM MIDNIGHT OF EPOCH ***
********************************** TRAJECTORY INTEGRATION FOR CASE   2 ***********************************

        *** TRAJECTORY START

            * * * * * * * * * * * * * * * * * * *   ECI * * * * * * * * * * * * * * * * * * * *
SEG11 ENTRY TIME IS     .48200

        *** TRAJECTORY TERMINATION

        *** THIS CASE TOOK       .066  SECONDS TO INTEGRATE A SFAN OF    247.0000  MINUTES ***

            *** FROM          0.000  TO        2 /.000  MINUTES FROM MIDNIGHT OF EPOCH ***
********************************** TRAJECTOR' .NTEGRATION FOR CASE   3 ***********************************

        *** TRAJECTORY START

            * * * * * * * * * * * * * * * * * * *   ECI * * * * * * * * * * * * * * * * * * * *
SEG11 ENTRY TIME IS     .55500

        *** TRAJECTORY TERMINATION
        *** THIS CASE TOCK       .072  SECONDS TO INTEGRATE A SFAN OF    243.0000  MINUTES ***

            *** FROM          0.000  TO        243.000  MINUTES FROM MIDNIGHT OF EPOCH ***
ENTER SEGMENT 61 AT      .6 SECONDS.  EXECUTION TIME FCR SEGMENT 10 WAS      .3 CP SECS.
```

VTS		73	1	1	0	30	0.000000	L	.29998091E+09	.10000000E+01	.30000000E+01	2	R	S-V1-V2-V3
VTS	AND	73	1	1	0	30	0.000000	Q	-.39000497E-03	0.	0.	1	TOA	VS1-VS2
VTS	AND	73	1	1	0	30	0.000000	Q	.34658442E-02	0.	0.	3	TOA	VS1-VS2
VTS	AND	73	1	1	0	30	0.000000	Q	.13038526E-03	0.	0.	2	TOA	VS1-VS2
AND		73	1	1	0	30	0.000000	7	.26648065E+03	0.	0.	1	RD	S-V1
AND		73	1	1	0	30	0.000000	L	.32874355E+09	.30000000E+01	.20000000E+01	1	R	S-V1-V2-V3
AND		73	1	1	0	30	0.000000	M	.33732343E+03	.10000000E+01	.20000000E+01	3	RD	S-V1-V2-V3
AND		73	1	1	0	30	0.000000	P	.10367035E+00	0.	.10000000E+01	2	TDOA	SV1V2-SV2
AND		73	1	1	0	30	0.000000	L	.23873526E+09	.30000000E+01	.10000000E+01	2	R	S-V1-V2-V3
AND		73	1	1	0	30	0.000000	P	.19616991E+00	0.	.30000000E+01	2	TDOA	SV1V2-SV2
AND		73	1	1	0	30	0.000000	M	-.11278630E+04	.10000000E+01	.30000000E+01	2	RD	S-V1-V2-V3
AND	VTS	73	1	1	0	30	0.000000	R	.24310022E+00	0.	0.	1	3WR	S1V1-S1V2
AND	VTS	73	1	1	0	30	0.000000	R	.30768046E+00	0.	0.	3	3WR	S1V1-S1V2
AND	VTS	73	1	1	0	30	0.000000	R	.18663151E+00	0.	0.	2	3WR	S1V1-S1V2
DUM		73	1	1	0	30	0.000000	J	.73076107E+08	-.14185904E+03	.30000000E+01	1	R RD	V1-V2
DUM		73	1	1	0	30	0.000000	S	.19426939E+00	0.	.30000000E+01	1	MULT	V1EV2-V1V2
DUM		73	1	1	0	30	0.000000	N	.20813402E+09	.20000000E+01	.30000000E+01	1	R	V1-V2-V3
DUM		73	1	1	0	30	0.000000	O	-.11888149E+04	.20000000E+01	.30000000E+01	1	RD	V1-V2-V3
DUM		73	1	1	0	30	0.000000	J	.73940690E+08	-.19868900E+03	.20000000E+01	1	R RD	V1-V2
DUM		73	1	1	0	30	0.000000	S	.12098517E+00	0.	.20000000E+01	1	MULT	V1EV2-V1V2
DUM		73	1	1	0	30	0.000000	J	.13575791E+09	-.10469559E+04	.30000000E+01	2	R RD	V1-V2
VTS		73	1	1	0	45	0.000000	1	.11965843E+09	.13792611E+03	.46073076E+02	1	RAE	S-V1
VTS		73	1	1	0	45	0.000000	K	.19264435E+09	.27991368E+03	.30000000E+01	1	R RD	S-V1-V2
VTS		73	1	1	0	45	0.000000	K	.19339766E+09	.89170868E+02	.20000000E+01	1	R RD	S-V1-V2
VTS		73	1	1	0	45	0.000000	M	-.99126456E+03	.30000000E+01	.20000000E+01	1	RD	S-V1-V2-V3
VTS		73	1	1	0	45	0.000000	1	.15412109E+09	.96496525E+02	.51994251E+02	3	RAE	S-V1
VTS		73	1	1	0	45	0.000000	L	.36196033E+09	.10000000E+01	.20000000E+01	3	R	S-V1-V2-V3
VTS		73	1	1	0	45	0.000000	1	.92951319E+08	.14787171E+03	.90053600E+01	2	RAE	S-V1
VTS		73	1	1	0	45	0.000000	M	.10519570E+04	.30000000E+01	.10000000E+01	2	RD	S-V1-V2-V3
VTS		73	1	1	0	45	0.000000	K	.22705153E+09	.27769871E+03	.30000000E+01	2	R RD	S-V1-V2
VTS		73	1	1	0	45	0.000000	L	.30003746E+09	.10000000E+01	.30000000E+01	2	R	S-V1-V2-V3
VTS	AND	73	1	1	0	45	0.000000	Q	-.34202135E-03	0.	0.	1	TOA	VS1-VS2
VTS	AND	73	1	1	0	45	0.000000	Q	.31835940E-02	0.	0.	3	TOA	VS1-VS2
VTS	AND	73	1	1	0	45	0.000000	Q	.10569858E-02	0.	0.	2	TOA	VS1-VS2
AND		73	1	1	0	45	0.000000	7	.28826838E+03	0.	0.	1	RD	S-V1
AND		73	1	1	0	45	0.000000	L	.32783414E+09	.30000000E+01	.20000000E+01	1	R	S-V1-V2-V3
AND		73	1	1	0	45	0.000000	M	.15744040E+03	.10000000E+01	.20000000E+01	3	RD	S-V1-V2-V3
AND		73	1	1	0	45	0.000000	P	.10352322E+00	0.	.10000000E+01	2	TDOA	SV1V2-SV2
AND		73	1	1	0	45	0.000000	L	.23663667E+09	.30000000E+01	.10000000E+01	2	R	S-V1-V2-V3
AND		73	1	1	0	45	0.000000	P	.19649460E+00	0.	.30000000E+01	2	TDOA	SV1V2-SV2
AND		73	1	1	0	45	0.000000	M	-.77122338E+03	.10000000E+01	.30000000E+01	2	RD	S-V1-V2-V3
AND	VTS	73	1	1	0	45	0.000000	R	.24365606E+00	0.	0.	1	3WR	S1V1-S1V2
AND	VTS	73	1	1	0	45	0.000000	R	.31020740E+00	0.	0.	3	3WR	S1V1-S1V2

ITEM	DESCRIPTION	REFERENCE SECTION
5	DATA GENERATION II output. Each line corresponds to a primary station, secondary station, year, month, day, hour, minute, second, data set type, generated observations, vehicle ID number, observation data abbreviations, and station and vehicle sequence numbers. The output description is:	Item 4

STA	ST2	Y	M	D	H	M	SEC	OT	OB1	OB2 (V3)	OB3 (V2)	V1		
Primary station ID	Secondary station ID	Year	Month	Day	Hour	Minute	Second	Observation type	Observation data for all data set types	Observation data for Data Set Types 1, J, K, T, and U V3 ID No. for Data Set Types L, M, N, and O Zero for other data set types	Observation data for Data Set Types 1 and T V2 ID No. for Data Set Types J, K, L, M, N, O, P, S, and U Zero for other data set types	V1 ID No.	Observation data sets	Station and vehicle sequence Nos.

STA	ST2	Y	M	D	H	M	SEC	OT	DB1	DB2 (V3)	DB3 (V2)	V1	5	
VTS		73	1	1	0	15	0.000000	1	.11908033E+09	.13875191E+03	.45901570E+02	1	RAE	S-V1
VTS		73	1	1	0	15	0.000000	K	.19232075E+09	.80385837E+02	.30000000E+01	1	R RD	S-V1-V2
VTS		73	1	1	0	15	0.000000	K	.19317728E+09	.15435345E+03	.20000000E+01	1	R RD	S-V1-V2
VTS		73	1	1	0	15	0.000000	M	-.85357078E+03	.30000000E+01	.20000000E+01	1	RD	S-V1-V2-V3
VTS		73	1	1	0	15	0.000000	1	.15182447E+09	.96745079E+02	.49046996E+02	3	RAE	S-V1
VTS		73	1	1	0	15	0.000000	L	.36190448E+09	.10000000E+01	.20000000E+01	3	R	S-V1-V2-V3
VTS		73	1	1	0	15	0.000000	1	.90991238E+08	.15616627E+03	.10431786E+02	2	RAE	S-V1
VTS		73	1	1	0	15	0.000000	M	.43460611E+03	.30000000E+01	.10000000E+01	2	RD	S-V1-V2-V3
VTS		73	1	1	0	15	0.000000	K	.22697431E+09	-.20198590E+03	.30000000E+01	2	R RD	S-V1-V2
VTS		73	1	1	0	15	0.000000	L	.30021472E+09	.10000000E+01	.30000000E+01	2	R	S-V1-V2-V3
VTS	AND	73	1	1	0	15	0.000000	Q	-.44255651E-03	0.	0.	1	TDA	VS1-VS2
VTS	AND	73	1	1	0	15	0.000000	Q	.37450345E-02	0.	0.	3	TDA	VS1-VS2
VTS	AND	73	1	1	0	15	0.000000	Q	-.82450442E-03	0.	0.	2	TDA	VS1-VS2
AND		73	1	1	0	15	0.000000	7	.24319331E+03	0.	0.	1	RD	S-V1
AND		73	1	1	0	15	0.000000	L	.32959550E+09	.30000000E+01	.20000000E+01	1	R	S-V1-V2-V3
AND		73	1	1	0	15	0.000000	M	.52080722E+03	.10000000E+01	.20000000E+01	3	RD	S-V1-V2-V3
AND		73	1	1	0	15	0.000000	P	.10351092E+00	0.	.10000000E+01	2	TDOA	SV1V2-SV2
AND		73	1	1	0	15	0.000000	L	.23913938E+09	.30000000E+01	.10000000E+01	2	R	S-V1-V2-V3
AND		73	1	1	0	15	0.000000	P	.19553368E+00	0.	.30000000E+01	2	TDOA	SV1V2-SV2
AND		73	1	1	0	15	0.000000	M	-.14767996E+04	.10000000E+01	.30000000E+01	2	RD	S-V1-V2-V3
AND	VTS	73	1	1	0	15	0.000000	R	.24258108E+00	0.	0.	1	3WR	S1V1-S1V2
AND	VTS	73	1	1	0	15	0.000000	R	.30497605E+00	0.	0.	3	3WR	S1V1-S1V2
AND	VTS	73	1	1	0	15	0.000000	R	.18584647E+00	0.	0.	2	3WR	S1V1-S1V2
DUM		73	1	1	0	15	0.000000	J	.73240415E+08	-.22264991E+03	.30000000E+01	1	R RD	V1-V2
DUM		73	1	1	0	15	0.000000	S	.19231125E+00	0.	.30000000E+01	1	MULT	V1EV2-V1V2
DUM		73	1	1	0	15	0.000000	N	.20922348E+09	.20000000E+01	.30000000E+01	1	R	V1-V2-V3
DUM		73	1	1	0	15	0.000000	O	-.12305741E+04	.20000000E+01	.30000000E+01	1	RD	V1-V2-V3
DUM		73	1	1	0	15	0.000000	J	.74096949E+08	-.14868230E+03	.20000000E+01	1	R RD	V1-V2
DUM		73	1	1	0	15	0.000000	S	.11999225E+00	0.	.20000000E+01	1	MULT	V1EV2-V1V2
DUM		73	1	1	0	15	0.000000	J	.13598307E+09	-.10079242E+04	.30000000E+01	2	R RD	V1-V2
VTS		73	1	1	0	30	0.000000	1	.11936148E+09	.13831957E+03	.45992510E+02	1	RAE	S-V1
VTS		73	1	1	0	30	0.000000	K	.19243759E+09	.17959777E+03	.30000000E+01	1	R RD	S-V1-V2
VTS		73	1	1	0	30	0.000000	K	.19310217E+09	.12276780E+03	.20000000E+01	1	R RD	S-V1-V2
VTS		73	1	1	0	30	0.000000	M	-.92418810E+03	.30000000E+01	.20000000E+01	1	RD	S-V1-V2-V3
VTS		73	1	1	0	30	0.000000	1	.15391717E+09	.96589686E+02	.50530271E+02	3	RAE	S-V1
VTS		73	1	1	0	30	0.000000	L	.36201577E+09	.10000000E+01	.20000000E+01	3	R	S-V1-V2-V3
VTS		73	1	1	0	30	0.000000	1	.91846886E+08	.15199145E+03	.95632226E+01	2	RAE	S-V1
VTS		73	1	1	0	30	0.000000	M	.75184476E+03	.30000000E+01	.10000000E+01	2	RD	S-V1-V2-V3
VTS		73	1	1	0	30	0.000000	K	.22690480E+09	.45436889E+02	.30000000E+01	2	R RD	S-V1-V2

AND	VTS	73	1	1	0	45	0.000000	R	.18795073E+00	0.	0.	2	3WR	S1V1-S1V2
DUM		73	1	1	0	45	0.000000	J	.72985924E+08	-.58217159E+02	.30000000E+01	1	R RD	V1-V2
DUM		73	1	1	0	45	0.000000	S	.19606784E+00	0.	.30000000E+01	1	MULT	V1EV2-V1V2
DUM		73	1	1	0	45	0.000000	N	.20738614E+09	.20000000E+01	.30000000E+01	1	R	V1-V2-V3
DUM		73	1	1	0	45	0.000000	O	-.11386526E+04	.20000000E+01	.30000000E+01	1	RD	V1-V2-V3
DUM		73	1	1	0	45	0.000000	J	.73739227E+08	-.24895997E+03	.20000000E+01	1	R RD	V1-V2
DUM		73	1	1	0	45	0.000000	S	.12239129E+00	0.	.20000000E+01	1	MULT	V1EV2-V1V2
DUM		73	1	1	0	45	0.000000	J	.13410022E+09	-.10804354E+04	.30000000E+01	2	R RD	V1-V2
VTS		73	1	1	1	0	0.000000	I	.11996958E+09	.13757347E+03	.46143506E+02	1	RAE	S-V1
VTS		73	1	1	1	0	0.000000	K	.19294123E+09	.37955802E+03	.30000000E+01	1	R RD	S-V1-V2
VTS		73	1	1	1	0	0.000000	K	.19346242E+09	.54729742E+02	.20000000E+01	1	R RD	S-V1-V2
VTS		73	1	1	1	0	0.000000	M	-.10548312E+04	.30000000E+01	.20000000E+01	1	RD	S-V1-V2-V3
VTS		73	1	1	1	0	0.000000	I	.15513529E+09	.96467906E+02	.53439234E+02	3	RAE	S-V1
VTS		73	1	1	1	0	0.000000	L	.36174258E+09	.10000000E+01	.20000000E+01	3	R	S-V1-V2-V3
VTS		73	1	1	1	0	0.000000	I	.94284293E+08	.14385130E+03	.87530414E+01	2	RAE	S-V1
VTS		73	1	1	1	0	0.000000	M	.13280911E+04	.30000000E+01	.10000000E+01	2	RD	S-V1-V2-V3
VTS		73	1	1	1	0	0.000000	K	.22739873E+09	.49024097E+03	.30000000E+01	2	R RD	S-V1-V2
VTS		73	1	1	1	0	0.000000	L	.30037339E+09	.10000000E+01	.30000000E+01	2	R	S-V1-V2-V3
VTS	AND	73	1	1	1	0	0.000000	Q	-.29882326E-03	0.	0.	1	TOA	VS1-VS2
VTS	AND	73	1	1	1	0	0.000000	G	.28987876E-02	0.	0.	3	TOA	VS1-VS2
VTS	AND	73	1	1	1	0	0.000000	G	.19381818E-02	0.	0.	2	TOA	VS1-VS2
AND		73	1	1	1	0	0.000000	7	.30847196E+03	0.	0.	1	RD	S-V1
AND		73	1	1	1	0	0.000000	L	.32687064E+09	.30000000E+01	.20000000E+01	1	R	S-V1-V2-V3
AND		73	1	1	1	0	0.000000	M	-.18598518E+02	.10000000E+01	.20000000E+01	3	RD	S-V1-V2-V3
AND		73	1	1	1	0	0.000000	P	.10307188E+00	0.	.10000000E+01	2	TDOA	SV1V2-SV2
AND		73	1	1	1	0	0.000000	L	.23884228E+09	.30000000E+01	.10000000E+01	2	R	S-V1-V2-V3
AND		73	1	1	1	0	0.000000	P	.19624433E+00	0.	.30000000E+01	2	TDOA	SV1V2-SV2
AND		73	1	1	1	0	0.000000	M	-.41593905E+03	.10000000E+01	.30000000E+01	2	RD	S-V1-V2-V3
AND	VTS	73	1	1	1	0	0.000000	R	.24424555E+00	0.	0.	1	3WR	S1V1-S1V2
AND	VTS	73	1	1	1	0	0.000000	R	.31255447E+00	0.	0.	3	3WR	S1V1-S1V2
AND	VTS	73	1	1	1	0	0.000000	R	.18978006E+00	0.	0.	2	3WR	S1V1-S1V2
DUM		73	1	1	1	0	0.000000	J	.72971656E+08	.26558766E+02	.30000000E+01	1	R RD	V1-V2
DUM		73	1	1	1	0	0.000000	S	.19770251E+00	0.	.30000000E+01	1	MULT	V1EV2-V1V2
DUM		73	1	1	1	0	0.000000	N	.20618609E+09	.20000000E+01	.30000000E+01	1	R	V1-V2-V3
DUM		73	1	1	1	0	0.000000	O	-.10830021E+04	.20000000E+01	.30000000E+01	1	RD	V1-V2-V3
DUM		73	1	1	1	0	0.000000	J	.73492846E+08	-.29826952E+03	.20000000E+01	1	R RD	V1-V2
DUM		73	1	1	1	0	0.000000	S	.12418812E+00	0.	.20000000E+01	1	MULT	V1EV2-V1V2
DUM		73	1	1	1	0	0.000000	J	.13311444E+09	-.11095609E+04	.30000000E+01	2	R RD	V1-V2
VTS		73	1	1	1	15	0.000000	I	.12029327E+09	.13726335E+03	.46204090E+02	1	RAE	S-V1
VTS		73	1	1	1	15	0.000000	K	.19332685E+09	.47683223E+03	.30000000E+01	1	R RD	S-V1-V2
VTS		73	1	1	1	15	0.000000	K	.19349638E+09	.21002149E+02	.20000000E+01	1	R RD	S-V1-V2
VTS		73	1	1	1	15	0.000000	M	-.11145255E+04	.30000000E+01	.20000000E+01	1	RD	S-V1-V2-V3
VTS		73	1	1	1	15	0.000000	I	.15605897E+09	.96507051E+02	.54865548E+02	3	RAE	S-V1

VTS		73	1	1	1	15	0.000000	L	.36136603E+09	.10000000E+01	.20000000E+01	3	R	S-V1-V2-V3
VTS		73	1	1	1	15	.000000	1	.95823086E+08	.13996870E+03	.87925600E+01	2	RAE	S-V1
VTS		73	1	1	1	15	0.000000	M	.15810508E+04	.30000000E+01	.10000000E+01	2	RD	S-V1-V2-V3
VTS		73	1	1	1	15	0.000000	K	.22792704E+09	.67972399E+03	.30000000E+01	2	R RD	S-V1-V2
VTS		73	1	1	1	15	0.000000	L	.30036061E+09	.10000000E+01	.30000000E+01	2	R	S-V1-V2-V3
VTS	AND	73	1	1	1	15	0.000000	Q	-.26059212E-03	0.	0.	1	TOA	VS1-VS2
VTS	AND	73	1	1	1	15	0.000000	Q	.26118474E-02	0.	0.	3	TOA	VS1-VS2
VTS	AND	73	1	1	1	15	0.000000	Q	.27597947E-02	0.	0.	2	TOA	VS1-VS2
AND		73	1	1	1	15	0.000000	7	.32702012E+03	0.	0.	1	RD	S-V1
AND		73	1	1	1	15	0.000000	L	.32585651E+09	.30000000E+01	.20000000E+01	1	R	S-V1-V2-V3
AND		73	1	1	1	15	0.000000	M	-.19019439E+03	.10000000E+01	.20000000E+01	3	RD	S-V1-V2-V3
AND		73	1	1	1	15	0.000000	P	.10232534E+00	0.	.10000000E+01	2	TDOA	SV1V2-SV2
AND		73	1	1	1	15	0.000000	L	.23934514E+09	.30000000E+01	.10000000E+01	2	R	S-V1-V2-V3
AND		73	1	1	1	15	0.000000	P	.19570019E+00	0.	.30000000E+01	2	TDOA	SV1V2-SV2
AND		73	1	1	1	15	0.000000	M	-.70568146E+02	.10000000E+01	.30000000E+01	2	RD	S-V1-V2-V3
AND	VTS	73	1	1	1	15	0.000000	R	.24486553E+00	0.	0.	1	3WR	S1V1-S1V2
AND	VTS	73	1	1	1	15	0.000000	R	.31471958E+00	0.	0.	3	3WR	S1V1-S1V2
AND	VTS	73	1	1	1	15	0.000000	R	.19208750E+00	0.	0.	2	3WR	S1V1-S1V2
DUM		73	1	1	1	15	0.000000	J	.73033572E+08	.11081460E+03	.30000000E+01	1	R RD	V1-V2
DUM		73	1	1	1	15	0.000000	S	.19917089E+00	0.	.30000000E+01	1	MULT	V1EV2-V1V2
DUM		73	1	1	1	15	0.000000	N	.20513752E+09	.20000000E+01	.30000000E+01	1	R	V1-V2-V3
DUM		73	1	1	1	15	0.000000	O	-.10247131E+04	.20000000E+01	.30000000E+01	1	RD	V1-V2-V3
DUM		73	1	1	1	15	0.000000	J	.73203107E+08	-.34501548E+03	.20000000E+01	1	R RD	V1-V2
DUM		73	1	1	1	15	0.000000	S	.12634566E+00	0.	.20000000E+01	1	MULT	V1EV2-V1V2
DUM		73	1	1	1	15	0.000000	J	.13210395E+09	-.11355277E+04	.30000000E+01	2	R RD	V1-V2
VTS		73	1	1	1	30	0.000000	1	.12062784E+09	.13699715E+03	.46255162E+02	1	RAE	S-V1
VTS		73	1	1	1	30	0.000000	K	.19379834E+09	.57015129E+03	.30000000E+01	1	R RD	S-V1-V2
VTS		73	1	1	1	30	0.000000	K	.19350101E+09	-.10091927E+02	.20000000E+01	1	R RD	S-V1-V2
VTS		73	1	1	1	30	0.000000	M	-.11694199E+04	.30000000E+01	.20000000E+01	1	RD	S-V1-V2-V3
VTS		73	1	1	1	30	0.000000	1	.15689138E+09	.96618204E+02	.56273520E+02	3	RAE	S-V1
VTS		73	1	1	1	30	0.000000	L	.36083569E+09	.10000000E+01	.20000000E+01	3	R	S-V1-V2-V3
VTS		73	1	1	1	30	0.000000	1	.97543566E+08	.13625511E+03	.91034380E+01	2	RAE	S-V1
VTS		73	1	1	1	30	0.000000	M	.18092158E+04	.30000000E+01	.10000000E+01	2	RD	S-V1-V2-V3
VTS		73	1	1	1	30	0.000000	K	.22861470E+09	.84413893E+03	.30000000E+01	2	R RD	S-V1-V2
VTS		73	1	1	1	30	0.000000	L	.30178520E+09	.10000000E+01	.30000000E+01	2	R	S-V1-V2-V3
VTS	AND	73	1	1	1	30	0.000000	Q	-.22750247E-03	0.	0.	1	TOA	VS1-VS2
VTS	AND	73	1	1	1	30	0.000000	Q	.23231238E-02	0.	0.	3	TOA	VS1-VS2
VTS	AND	73	1	1	1	30	0.000000	Q	.35110979E-02	0.	0.	2	TOA	VS1-VS2
AND		73	1	1	1	30	0.000000	7	.34395462E+03	0.	0.	1	RD	S-V1
AND		73	1	1	1	30	0.000000	L	.32479578E+09	.30000000E+01	.20000000E+01	1	R	S-V1-V2-V3
AND		73	1	1	1	30	0.000000	M	-.35621730E+03	.10000000E+01	.20000000E+01	3	RD	S-V1-V2-V3
AND		73	1	1	1	30	0.000000	P	.10129909E+00	0.	.10000000E+01	2	TDOA	SV1V2-SV2
AND		73	1	1	1	30	0.000000	L	.24013366E+09	.30000000E+01	.10000000E+01	2	R	S-V1-V2-V3

AND		73	1	1	1	30	0.000000	P	.19478731E+00	0.	.30000000E+01	2	TDOA	SV1V2-SV2
AND		73	1	1	1	30	0.000000	M	.25741756E+03	.10000000E+01	.30000000E+01	2	RD	S-V1-V2-V3
AND	VTS	73	1	1	1	30	0.000000	R	.24551276E+00	0.	0.	1	3WR	S1V1-S1V2
AND	VTS	73	1	1	1	30	0.000000	R	.31670091E+00	0.	0.	3	3WR	S1V1-S1V2
AND	VTS	73	1	1	1	30	0.000000	R	.19483468E+00	0.	0.	2	3WR	S1V1-S1V2
DUM		73	1	1	1	30	0.000000	J	.73170498E+08	.15299603E+03	.30000000E+01	1	R RD	V1-V2
DUM		73	1	1	1	30	0.000000	S	.20047196E+00	0.	.30000000E+01	1	MULT	V1EV2-V1V2
DUM		73	1	1	1	30	0.000000	N	.20424163E+09	.20000000E+01	.30000000E+01	1	R	V1-V2-V3
DUM		73	1	1	1	30	0.000000	O	-.96633197E+03	.20000000E+01	.30000000E+01	1	RD	V1-V2-V3
DUM		73	1	1	1	30	0.000000	J	.72873170E+08	-.38724718E+03	.20000000E+01	1	R RD	V1-V2
DUM		73	1	1	1	30	0.000000	S	.12882793E+00	0.	.20000000E+01	1	MULT	V1EV2-V1V2
DUM		73	1	1	1	30	0.000000	J	.13107113E+09	-.11593280E+04	.30000000E+01	2	R RD	V1-V2
VTS		73	1	1	1	45	0.000000	I	.12097158E+09	.13677603E+03	.46297081E+02	1	RAE	S-V1
VTS		73	1	1	1	45	0.000000	K	.19435150E+09	.65807525E+03	.30000000E+01	1	R RD	S-V1-V2
VTS		73	1	1	1	45	0.000000	K	.19347966E+09	-.36374111E+02	.20000000E+01	1	R RD	S-V1-V2
VTS		73	1	1	1	45	0.000000	M	-.12179918E+04	.30000000E+01	.20000000E+01	1	RD	S-V1-V2-V3
VTS		73	1	1	1	45	0.000000	I	.15763189E+09	.96806760E+02	.57663450E+02	3	RAE	S-V1
VTS		73	1	1	1	45	0.000000	L	.36015758E+09	.10000000E+01	.20000000E+01	3	R	S-V1-V2-V3
VTS		73	1	1	1	45	0.000000	I	.99421133E+08	.13273370E+03	.96605045E+01	2	RAE	S-V1
VTS		73	1	1	1	45	0.000000	M	.20133077E+04	.30000000E+01	.10000000E+01	2	RD	S-V1-V2-V3
VTS		73	1	1	1	45	0.000000	K	.22943874E+09	.98277818E+03	.30000000E+01	2	R RD	S-V1-V2
VTS		73	1	1	1	45	0.000000	L	.30281866E+09	.10000000E+01	.30000000E+01	2	R	S-V1-V2-V3
VTS	AND	73	1	1	1	45	0.000000	Q	-.19969139E-03	0.	0.	1	TOA	VS1-VS2
VTS	AND	73	1	1	1	45	0.000000	Q	.20329035E-02	0.	0.	3	TOA	VS1-VS2
VTS	AND	73	1	1	1	45	0.000000	Q	.41849420E-02	0.	0.	2	TOA	VS1-VS2
AND		73	1	1	1	45	0.000000	7	.35892990E+03	0.	0.	1	RD	S-V1
AND		73	1	1	1	45	0.000000	L	.32369355E+09	.30000000E+01	.20000000E+01	1	R	S-V1-V2-V3
AND		73	1	1	1	45	0.000000	M	-.51437327E+03	.10000000E+01	.20000000E+01	3	RD	S-V1-V2-V3
AND		73	1	1	1	45	0.000000	P	.10031453E+00	0.	.10000000E+01	2	TDOA	SV1V2-SV2
AND		73	1	1	1	45	.000000	L	.24119277E+09	.30000000E+01	.10000000E+01	2	R	S-V1-V2-V3
AND		73	1	1	1	45	0.000000	P	.19352426E+00	0.	.30000000E+01	2	TDOA	SV1V2-SV2
AND		73	1	1	1	45	0.000000	M	.56203790E+03	.10000000E+01	.30000000E+01	2	RD	S-V1-V2-V3
AND	VTS	73	1	1	1	45	0.000000	R	.24618392E+00	0.	0.	1	3WR	S1V1-S1V2
AND	VTS	73	1	1	1	45	0.000000	R	.31849686E+00	0.	0.	3	3WR	S1V1-S1V2
AND	VTS	73	1	1	1	45	0.000000	R	.19797874E+00	0.	0.	2	3WR	S1V1-S1V2
DUM		73	1	1	1	45	0.000000	J	.73379915E+08	.27168059E+03	.30000000E+01	1	R RD	V1-V2
DUM		73	1	1	1	45	0.000000	S	.20160609E+00	0.	.30000000E+01	1	MULT	V1EV2-V1V2
DUM		73	1	1	1	45	0.000000	N	.20339752E+09	.20000000E+01	.30000000E+01	1	R	V1-V2-V3
DUM		73	1	1	1	45	.000000	O	-.91933707E+03	.20000000E+01	.30000000E+01	1	RD	V1-V2-V3
DUM		73	1	1	1	45	0.000000	J	.72538074E+08	-.42276877E+03	.20000000E+01	1	R RD	V1-V2
DUM		73	1	1	1	45	0.000000	S	.13159454E+00	0.	.20000000E+01	1	MULT	V1EV2-V1V2
DUM		73	1	1	1	45	0.000000	J	.13031761E+09	-.11816177E+04	.30000000E+01	2	R RD	V1-V2
VTS		73	1	1	2	0	.000000	I	.12132278E+09	.13660084E+03	.46330219E+02	1	RAE	S-V1

VTS		73	1	1	2	0	0.000000	K	.19498087E+09	.73933390E+03	.30000000E+01	1	R RD	S-V1-V2
VTS		73	1	1	2	0	0.000000	K	.19343767E+09	-.55559274E+02	.20000000E+01	1	R RD	S-V1-V2
VTS		73	1	1	2	0	0.000000	M	-.12582170E+04	.30000000E+01	.20000000E+01	1	RD	S-V1-V2-V3
VTS		73	1	1	2	0	0.000000	I	.15827993E+09	.97079441E+02	.59035573E+02	3	RAE	S-V1
VTS		73	1	1	2	0	0.000000	L	.35933941E+09	.10000000E+01	.20000000E+01	3	R	S-V1-V2-V3
VTS		73	1	1	2	0	0.000000	I	.10143150E+09	.12941968E+03	.10435959E+02	2	RAE	S-V1
VTS		73	1	1	2	0	0.000000	M	.21950644E+04	.30000000E+01	.10000000E+01	2	RD	S-V1-V2-V3
VTS		73	1	1	2	0	0.000000	K	.23037609E+09	.18960938E+04	.30000000E+01	2	R RD	S-V1-V2
VTS		73	1	1	2	0	0.000000	L	.30403419E+09	.10000000E+01	.30000000E+01	2	R	S-V1-V2-V3
VTS	AND	73	1	1	2	0	0.000000	Q	-.17727309E-03	0.	0.	1	TOA	VS1-VS2
VTS	AND	73	1	1	2	0	0.000000	Q	.17414169E-02	0.	0.	3	TOA	VS1-VS2
VTS	AND	73	1	1	2	0	0.000000	Q	.47775516E-02	0.	0.	2	TOA	VS1-VS2
AND		73	1	1	2	0	0.000000	7	.37221258E+03	0.	0.	1	RD	S-V1
AND		73	1	1	2	0	0.000000	L	.32255649E+09	.30000000E+01	.30000000E+01	1	R	S-V1-V2-V3
AND		73	1	1	2	0	0.000000	M	-.66429483E+03	.10000000E+01	.20000000E+01	3	RD	S-V1-V2-V3
AND		73	1	1	2	0	0.000000	P	.98498121E-01	0.	.10000000E+01	2	TDOA	SV1V2-SV2
AND		73	1	1	2	0	0.000000	L	.24250527E+09	.30000000E+01	.10000000E+01	2	R	S-V1-V2-V3
AND		73	1	1	2	0	0.000000	P	.19193239E+00	0.	.30000000E+01	2	TDOA	SV1V2-SV2
AND		73	1	1	2	0	0.000000	M	.83899815E+03	.10000000E+01	.30000000E+01	2	RD	S-V1-V2-V3
AND	VTS	73	1	1	2	0	0.000000	R	.24687563E+00	0.	0.	1	3WR	S1V1-S1V2
AND	VTS	73	1	1	2	0	0.000000	R	.32010604E+00	0.	0.	3	3WR	S1V1-S1V2
AND	VTS	73	1	1	2	0	0.000000	R	.20147407E+00	0.	0.	2	3WR	S1V1-S1V2
DUM		73	1	1	2	0	0.000000	J	.73658093E+08	.34560303E+03	.30000000E+01	1	R RD	V1-V2
DUM		73	1	1	2	0	0.000000	S	.20257490E+00	0.	.30000000E+ 1	1	MULT	V1EV2-V1V2
DUM		73	1	1	2	0	0.000000	N	.20260269E+09	.20000000E+01	.30000000E+01	1	R	V1-V2-V3
DUM		73	1	1	2	0	0.000000	O	-.85705472E+03	.20000000E+01	.30000000E+01	1	RD	V1-V2-V3
DUM		73	1	1	2	0	0.000000	J	.72114887E+08	-.44929014E+03	.20000000E+01	1	R RD	V1-V2
DUM		73	1	1	2	0	0.000000	S	.13460225E+00	0.	.20000000E+01	1	MULT	V1EV2-V1V2
DUM		73	1	1	2	0	0.000000	J	.12894459E+09	-.12026578E+04	.30000000E+01	2	R RD	V1-V2
VTS		73	1	1	2	15	0.000000	I	.12167973E+09	.13647218E+03	.46354953E+02	1	RAE	S-V1
VTS		73	1	1	2	15	0.000000	K	.19567997E+09	.81284379E+03	.30000000E+01	1	R RD	S-V1-V2
VTS		73	1	1	2	15	0.000000	K	.19338245E+09	-.65424091E+02	.20000000E+01	1	R RD	S-V1-V2
VTS		73	1	1	2	15	0.000000	M	-.12877473E+04	.30000000E+01	.20000000E+01	1	RD	S-V1-V2-V3
VTS		73	1	1	2	15	0.000000	I	.15883500E+09	.97444505E+02	.60390027E+02	3	RAE	S-V1
VTS		73	1	1	2	15	0.000000	L	.35839096E+09	.10000000E+01	.20000000E+01	3	R	S-V1-V2-V3
VTS		73	1	1	2	15	0.000000	I	.10355129E+09	.12632100E+03	.11401183E+02	2	RAE	S-V1
VTS		73	1	1	2	15	0.000000	M	.23568868E+04	.30000000E+01	.10000000E+01	2	RD	S-V1-V2-V3
VTS		73	1	1	2	15	0.000000	K	.23140453E+09	.11854852E+04	.30000000E+01	2	R RD	S-V1-V2
VTS		73	1	1	2	15	0.000000	L	.30540477E+09	.10000000E+01	.30000000E+01	2	R	S-V1-V2-V3
VTS	AND	73	1	1	2	15	0.000000	Q	-.16033571E-03	0.	0.	1	TOA	VS1-VS2
VTS	AND	73	1	1	2	15	0.000000	Q	.14488456E-02	0.	0.	3	TOA	VS1-VS2
VTS	AND	73	1	1	2	15	0.000000	Q	.52880903E-02	0.	0.	2	TOA	VS1-VS2
AND		73	1	1	2	15	0.000000	7	.38368086E+03	0.	0.	1	RD	S-V1

AND		73	1	1	2	15	0.000000	L	.32139325E+09	.30000000E+01	.20000000E+01	1	R	S-V1-V2-V3
AND		73	1	1	2	15	0.000000	M	-.80171509E+03	.10000000E+01	.20000000E+01	3	RD	S-V1-V2-V3
AND		73	1	1	2	15	0.000000	P	.96780416E-01	0.	.10000000E+01	2	TDOA	SV1V2-SV2
AND		73	1	1	2	15	0.000000	L	.24435289E+09	.30000000E+01	.10000000E+01	2	R	S-V1-V2-V3
AND		73	1	1	2	15	0.000000	P	.19003510E+00	0.	.30000000E+01	2	TDOA	SV1V2-SV2
AND		73	1	1	2	15	0.000000	M	.10856871E+04	.10000000E+01	.30000000E+01	2	RD	S-V1-V2-V3
AND	VTS	73	1	1	2	15	0.000000	R	.24758452E+00	0.	0.	1	3WR	S1V1-S1V2
AND	VTS	73	1	1	2	15	0.000000	R	.32152726E+00	0.	0.	3	3WR	S1V1-S1V2
AND	VTS	73	1	1	2	15	0.000000	R	.20527397E+00	0.	0.	2	3WR	S1V1-S1V2
DUM		73	1	1	2	15	0.000000	J	.74000243E+08	.41367313E+03	.30000000E+01	1	R RD	V1-V2
DUM		73	1	1	2	15	0.000000	S	.20338112E+00	0.	.30000000E+01	1	MULT	V1EV2-V1V2
DUM		73	1	1	2	15	0.000000	N	.20185348E+09	.20000000E+01	.30000000E+01	1	R	V1-V2-V3
DUM		73	1	1	2	15	0.000000	O	-.80865004E+03	.20000000E+01	.30000000E+01	1	RD	V1-V2-V3
DUM		73	1	1	2	15	0.000000	J	.71702719E+08	-.46459475E+03	.20000000E+01	1	R RD	V1-V2
DUM		73	1	1	2	15	0.000000	S	.13780630E+00	0.	.20000000E+01	1	MULT	V1EV2-V1V2
DUM		73	1	1	2	15	0.000000	J	.12785324E+09	-.12223232E+04	.30000000E+01	2	R RD	V1-V2
VTS		73	1	1	2	30	0.000000	I	.12204073E+09	.13639037E+03	.46371649E+02	1	RAE	S-V1
VTS		73	1	1	2	30	0.000000	K	.19644140E+09	.87771709E+03	.30000000E+01	1	R RD	S-V1-V2
VTS		73	1	1	2	30	0.000000	K	.19332331E+09	-.63967282E+02	.20000000E+01	1	R RD	S-V1-V2
VTS		73	1	1	2	30	0.000000	M	-.13041250E+04	.30000000E+01	.20000000E+01	1	RD	S-V1-V2-V3
VTS		73	1	1	2	30	0.000000	I	.15929667E+09	.97912020E+02	.61726804E+02	3	RAE	S-V1
VTS		73	1	1	2	30	0.000000	L	.35732420E+09	.10000000E+01	.20000000E+01	3	R	S-V1-V2-V3
VTS		73	1	1	2	30	0.000000	I	.19575846E+09	.12343942E+03	.12528176E+02	2	RAE	S-V1
VTS		73	1	1	2	30	0.000000	M	.25015015E+04	.30000000E+01	.10000000E+01	2	RD	S-V1-V2-V3
VTS		73	1	1	2	30	0.000000	K	.23250342E+09	.12530574E+04	.30000000E+01	2	R RD	S-V1-V2
VTS		73	1	1	2	30	0.000000	L	.30690409E+09	.10000000E+01	.30000000E+01	2	R	S-V1-V2-V3
VTS	AND	73	1	1	2	30	0.000000	Q	-.14894119E-03	0.	0.	1	TOA	VS1-VS2
VTS	AND	73	1	1	2	30	0.000000	Q	.11553282E-02	0.	0.	3	TOA	VS1-VS2
VTS	AND	73	1	1	2	30	0.000000	Q	.57181029E-02	0.	0.	2	TOA	VS1-VS2
AND		73	1	1	2	30	0.000000	7	.39332379E+03	0.	0.	1	RD	S-V1
AND		73	1	1	2	30	0.000000	L	.32021463E+09	.30000000E+01	.20000000E+01	1	R	S-V1-V2-V3
AND		73	1	1	2	30	0.000000	M	-.92468045E+03	.10000000E+01	.20000000E+01	3	RD	S-V1-V2-V3
AND		73	1	1	2	30	0.000000	P	.94894903E-01	0.	.10000000E+01	2	TDOA	SV1V2-SV2
AND		73	1	1	2	30	0.000000	L	.24581741E+09	.30000000E+01	.10000000E+01	2	R	S-V1-V2-V3
AND		73	1	1	2	30	0.000000	P	.18785724E+00	0.	.30000000E+01	2	TDOA	SV1V2-SV2
AND		73	1	1	2	30	0.000000	M	.13010256E+04	.10000000E+01	.30000000E+01	2	RD	S-V1-V2-V3
AND	VTS	73	1	1	2	30	0.000000	R	.24830718E+00	0.	0.	1	3WR	S1V1-S1V2
AND	VTS	73	1	1	2	30	0.000000	R	.32275950E+00	0.	0.	3	3WR	S1V1-S1V2
AND	VTS	73	1	1	2	30	0.000000	R	.20933207E+00	0.	0.	2	3WR	S1V1-S1V2
DUM		73	1	1	2	30	0.000000	J	.74400675E+08	.47498540E+03	.30000000E+01	1	R RD	V1-V2
DUM		73	1	1	2	30	0.000000	S	.20402845E+00	0.	.30000000E+01	1	MULT	V1EV2-V1V2
DUM		73	1	1	2	30	0.000000	N	.20114563E+09	.20000000E+01	.30000000E+01	1	R	V1-V2-V3
DUM		73	1	1	2	30	0.000000	O	-.76517233E+03	.20000000E+01	.30000000E+01	1	RD	V1-V2-V3

DUM		73	1	1	2	30	0.000000	J	.71282581E+08	-.46669897E+03	.20000000E+01	1	R RD	V1-V2
DUM		73	1	1	2	30	0.000000	S	.14116155E+00	0.	.20000000E+01	1	MULT	V1EV2-V1V2
DUM		73	1	1	2	30	0.000000	J	.12674496E+09	-.12401577E+04	.30000000E+01	2	R RD	V1-V2
VTS		73	1	1	2	45	0.000000	1	.12240409E+09	.13635547E+03	.46380655E+02	1	RAE	S-V1
VTS		73	1	1	2	45	0.000000	K	.19725706E+09	.93326283E+03	.30000000E+01	1	R RD	S-V1-V2
VTS		73	1	1	2	45	0.000000	K	.19327120E+09	-.49545634E+02	.20000000E+01	1	R RD	S-V1-V2
VTS		73	1	1	2	45	0.000000	M	-.13050001E+04	.30000000E+01	.20000000E+01	1	RD	S-V1-V2-V3
VTS		73	1	1	2	45	0.000000	1	.15966456E+09	.98494202E+02	.63045695E+02	3	RAE	S-V1
VTS		73	1	1	2	45	0.000000	L	.35615338E+09	.10000000E+01	.20000000E+01	3	R	S-V1-V2-V3
VTS		73	1	1	2	45	0.000000	1	.10803254E+09	.12077175E+03	.13790574E+02	2	RAE	S-V1
VTS		73	1	1	2	45	0.000000	M	.26316706E+04	.30000000E+01	.10000000E+01	2	RD	S-V1-V2-V3
VTS		73	1	1	2	45	0.000000	K	.23365425E+09	.13013821E+04	.30000000E+01	2	R RD	S-V1-V2
VTS		73	1	1	2	45	0.000000	L	.30850723E+09	.10000000E+01	.30000000E+01	2	R	S-V1-V2-V3
VTS	AND	73	1	1	2	45	0.000000	Q	-.14312540E-03	0.	0.	1	TOA	VS1-VS2
VTS	AND	73	1	1	2	45	0.000000	Q	.86096704E-03	0.	0.	3	TOA	VS1-VS2
VTS	AND	73	1	1	2	45	0.000000	Q	.60709253E-02	0.	0.	2	TOA	VS1-VS2
AND		73	1	1	2	45	0.000000	7	.41114054E+03	0.	0.	1	RD	S-V1
AND		73	1	1	2	45	0.000000	L	.31903356E+09	.30000000E+01	.20000000E+01	1	R	S-V1-V2-V3
AND		73	1	1	2	45	.000000	M	-.10397644E+04	.10000000E+01	.20000000E+01	3	RD	S-V1-V2-V3
AND		73	1	1	2	45	0.000000	F	.92876895E-01	0.	.10000000E+01	2	TDOA	SV1V2-SV2
AND		73	1	1	2	45	0.000000	L	.24778130E+09	.30000000E+01	.10000000E+01	2	R	S-V1-V2-V3
AND		73	1	1	2	45	0.000000	P	.18542443E+00	0.	.30000000E+01	2	TDOA	SV1V2-SV2
AND		73	1	1	2	45	0.000000	M	.14852230E+04	.10000000E+01	.30000000E+01	2	RD	S-V1-V2-V3
AND	VTS	73	1	1	2	45	0.000000	R	.24904023E+00	0.	0.	1	3WR	S1V1-S1V2
AND	VTS	73	1	1	2	45	0.000000	R	.32380190E+00	0.	0.	3	3WR	S1V1-S1V2
AND	VTS	73	1	1	2	45	0.000000	R	.21360342E+00	0.	0.	2	3WR	S1V1-S1V2
DUM		73	1	1	2	45	0.000000	J	.74852972E+08	.52882125E+03	.30000000E+01	1	R RD	V1-V2
DUM		73	1	1	2	45	0.000000	S	.20452135E+00	0.	.30000000E+01	1	MULT	V1EV2-V1V2
DUM		73	1	1	2	45	0.000000	N	.20047468E+09	.20000000E+01	.30000000E+01	1	R	V1-V2-V3
DUM		73	1	1	2	45	0.000000	O	-.72663324E+03	.20000000E+01	.30000000E+01	1	RD	V1-V2-V3
DUM		73	1	1	2	45	0.000000	J	.70867111E+08	-.45398721E+03	.20000000E+01	1	R RD	V1-V2
DUM		73	1	1	2	45	0.000000	S	.14462348E+00	0.	.20000000E+01	1	MULT	V1EV2-V1V2
DUM		73	1	1	2	45	0.000000	J	.12562171E+09	-.12554545E+04	.30000000E+01	2	R RD	V1-V2
VTS		73	1	1	3	0	0.000000	1	.12276818E+09	.13636730E+03	.46382294E+02	1	RAE	S-V1
VTS		73	1	1	3	0	0.000000	K	.19811832E+09	.97898113E+03	.30000000E+01	1	R RD	S-V1-V2
VTS		73	1	1	3	0	0.000000	K	.19323837E+09	-.20978677E+02	.20000000E+01	1	R RD	S-V1-V2
VTS		73	1	1	3	0	0.000000	M	-.12883216E+04	.30000000E+01	.20000000E+01	1	RD	S-V1-V2-V3
VTS		73	1	1	3	0	0.000000	1	.15993836E+09	.99205832E+02	.64346221E+02	3	RAE	S-V1
VTS		73	1	1	3	0	0.000000	L	.35489472E+09	.10000000E+01	.20000000E+01	3	R	S-V1-V2-V3
VTS		73	1	1	3	0	0.000000	1	.11035482E+09	.11831111E+03	.15164279E+02	2	RAE	S-V1
VTS		73	1	1	3	0	0.000000	M	.27499577E+04	.30000000E+01	.10000000E+01	2	RD	S-V1-V2-V3
VTS		73	1	1	3	0	0.000000	K	.23484098E+09	.13332861E+04	.30000000E+01	2	R RD	S-V1-V2
VTS		73	1	1	3	0	0.000000	L	.31019113E+09	.10000000E+01	.30000000E+01	2	R	S-V1-V2-V3

VTS	AND	73	1	1	3	0	0.000000	G	-.14289825E-03	0.	0.	1	TOA	VS1-VS2
VTS	AND	73	1	1	3	0	0.000000	Q	.56583320E-03	0.	0.	3	TOA	VS1-VS2
VTS	AND	73	1	1	3	0	0.000000	Q	.63511314E-02	0.	0.	2	TOA	VS1-VS2
AND		73	1	1	3	0	0.000000	7	.40713952E+03	0.	0.	1	RD	S-V1
AND		73	1	1	3	0	0.000000	L	.31786495E+09	.30000000E+01	.20000000E+01	1	R	S-V1-V2-V3
AND		73	1	1	3	0	0.000000	M	-.11178571E+04	.10000000E+01	.20000000E+01	3	RD	S-V1-V2-V3
AND		73	1	1	3	0	0.000000	P	.90762461E-01	0.	.10000000E+01	2	TDOA	SV1V2-SV2
AND		73	1	1	3	0	0.000000	L	.24992824E+09	.30000000E+01	.10000000E+01	2	R	S-V1-V2-V3
AND		73	1	1	3	0	0.000000	P	.18276261E+00	0.	.30000000E+01	2	TDOA	SV1V2-SV2
AND		73	1	1	3	0	0.000000	M	.16394944E+04	.10000000E+01	.30000000E+01	2	RD	S-V1-V2-V3
AND	VTS	73	1	1	3	0	0.000000	R	.24978034E+00	0.	0.	1	3WR	S1V1-S1V2
AND	VTS	73	1	1	3	0	0.000000	R	.32465375E+00	0.	0.	3	3WR	S1V1-S1V2
AND	VTS	73	1	1	3	0	0.000000	R	.21804537E+00	0.	0.	2	3WR	S1V1-S1V2
DUM		73	1	1	3	0	0.000000	J	.75350148E+08	.57464421E+03	.30000000E+01	1	R RD	V1-V2
DUM		73	1	1	3	0	0.000000	S	.20486490E+00	0.	.30000000E+01	1	MULT	V1EV2-V1V2
DUM		73	1	1	3	0	0.000000	N	.19983631E+09	.20000000E+01	.30000000E+01	1	R	V1-V2-V3
DUM		73	1	1	3	0	0.000000	O	-.69269872E+03	.20000000E+01	.30000000E+01	1	RD	V1-V2-V3
DUM		73	1	1	3	0	0.000000	J	.70470197E+08	-.42531559E+03	.20000000E+01	1	R RD	V1-V2
DUM		73	1	1	3	0	0.000000	S	.14814893E+00	0.	.20000000E+01	1	MULT	V1EV2-V1V2
DUM		73	1	1	3	0	0.000000	J	.12448616E+09	-.12573429E+04	.30000000E+01	2	R RD	V1-V2
VTS		73	1	1	3	15	0.000000	1	.12313137E+09	.13642543E+03	.46376856E+02	1	RAE	S-V1
VTS		73	1	1	3	15	0.000000	K	.19901618E+09	.10145519E+04	.30000000E+01	1	R RD	S-V1-V2
VTS		73	1	1	3	15	0.000000	K	.19323788E+09	.22379283E+02	.20000000E+01	1	R RD	S-V1-V2
VTS		73	1	1	3	15	0.000000	M	-.12524914E+04	.30000000E+01	.20000000E+01	1	RD	S-V1-V2-V3
VTS		73	1	1	3	15	0.000000	1	.16011783E+09	.10096478E+03	.65627552E+02	3	RAE	S-V1
VTS		73	1	1	3	15	0.000000	L	.35356614E+09	.10000000E+01	.20000000E+01	3	R	S-V1-V2-V3
VTS		73	1	1	3	15	0.000000	1	.11270831E+09	.11604803E+03	.10627780E+02	2	RAE	S-V1
VTS		73	1	1	3	15	0.000000	M	.28585530E+04	.30000000E+01	.10000000E+01	2	RD	S-V1-V2-V3
VTS		73	1	1	3	15	0.000000	K	.23605012E+09	.13516759E+04	.30000000E+01	2	R RD	S-V1-V2
VTS		73	1	1	3	15	0.000000	L	.31193493E+09	.10000000E+01	.30000000E+01	2	R	S-V1-V2-V3
VTS	AND	73	1	1	3	15	0.000000	Q	-.14824404E-03	0.	0.	1	TOA	VS1-VS2
VTS	AND	73	1	1	3	15	0.000000	Q	.26997233E-03	0.	0.	3	TOA	VS1-VS2
VTS	AND	73	1	1	3	15	0.000000	Q	.65640542E-02	0.	0.	2	TOA	VS1-VS2
AND		73	1	1	3	15	0.000000	7	.41133759E+03	0.	0.	1	RD	S-V1
AND		73	1	1	3	15	0.000000	L	.31672536E+09	.30000000E+01	.20000000E+01	1	R	S-V1-V2-V3
AND		73	1	1	3	15	0.000000	M	-.11843169E+04	.10000000E+01	.20000000E+01	3	RD	S-V1-V2-V3
AND		73	1	1	3	15	0.000000	P	.88537447E-01	0.	.10000000E+01	2	TDOA	SV1V2-SV2
AND		73	1	1	3	15	0.000000	L	.25224331E+09	.30000000E+01	.10000000E+01	2	R	S-V1-V2-V3
AND		73	1	1	3	15	0.000000	P	.17989762E+00	0.	.30000000E+01	2	TDOA	SV1V2-SV2
AND		73	1	1	3	15	0.000000	M	.17657799E+04	.10000000E+01	.30000000E+01	2	RD	S-V1-V2-V3
AND	VTS	73	1	1	3	15	0.000000	R	.25052420E+00	0.	0.	1	3WR	S1V1-S1V2
AND	VTS	73	1	1	3	15	0.000000	R	.32531451E+00	0.	0.	3	3WR	S1V1-S1V2
AND	VTS	73	1	1	3	15	0.000000	R	.22261809E+00	0.	0.	2	3WR	S1V1-S1V2

DUM		73	1	1	3	15	0.000000	J	.75884816E+08	.61208955E+03	.30000000E+01	1	R RD	V1-V2
DUM		73	1	1	3	15	0.000000	S	.20506464E+00	0.	.30000000E+01	1	MULT	V1EV2-V1V2
DUM		73	1	1	3	15	0.000000	N	.19922662E+09	.20000000E+01	.30000000E+01	1	R	V1-V2-V3
DUM		73	1	1	3	15	0.000000	O	-.66278114E+03	.20000000E+01	.30000000E+01	1	RD	V1-V2-V3
DUM		73	1	1	3	15	0.000000	J	.79136517E+08	-.38008309E+03	.20000000E+01	1	R RD	V1-V2
DUM		73	1	1	3	15	0.000000	S	.15169669E+00	0.	.20000000E+01	1	MULT	V1EV2-V1V2
DUM		73	1	1	3	15	0.000000	J	.12334180E+09	-.12748707E+04	.30000000E+01	2	R RD	V1-V2
VTS		73	1	1	3	30	0.000000	I	.12349209E+09	.13652920E+03	.46364595E+02	1	RAE	S-V1
VTS		73	1	1	3	30	0.000000	K	.19994142E+09	.10398193E+04	.30000000E+01	1	R RD	S-V1-V2
VTS		73	1	1	3	30	0.000000	K	.19328312E+09	.80598180E+02	.20000000E+01	1	R RD	S-V1-V2
VTS		73	1	1	3	30	0.000000	M	-.11964747E+04	.30000000E+01	.20000000E+01	1	RD	S-V1-V2-V3
VTS		73	1	1	3	30	0.000000	I	.16020275E+09	.10109263E+03	.66888391E+02	3	RAE	S-V1
VTS		73	1	1	3	30	0.000000	L	.35218677E+09	.10000000E+01	.20000000E+01	3	R	S-V1-V2-V3
VTS		73	1	1	3	30	0.000000	I	.11517780E+09	.11397144E+03	.18162231E+02	2	RAE	S-V1
VTS		73	1	1	3	30	0.000000	M	.29591537E+04	.30000000E+01	.10000000E+01	2	RD	S-V1-V2-V3
VTS		73	1	1	3	30	0.000000	K	.23727080E+09	.13594026E+04	.30000000E+01	2	R RD	S-V1-V2
VTS		73	1	1	3	30	0.000000	L	.31372013E+09	.10000000E+01	.30000000E+01	2	R	S-V1-V2-V3
VTS	AND	73	1	1	3	30	0.000000	Q	-.15912185E-03	0.	0.	1	TDA	VS1-VS2
VTS	AND	73	1	1	3	30	0.000000	Q	-.26590424E-04	0.	0.	3	TDA	VS1-VS2
VTS	AND	73	1	1	3	30	0.000000	Q	.67154003E-02	0.	0.	2	TDA	VS1-VS2
AND		73	1	1	3	30	0.000000	7	.41375919E+03	0.	0.	1	RD	S-V1
AND		73	1	1	3	30	0.000000	L	.31563249E+09	.30000000E+01	.20000000E+01	1	R	S-V1-V2-V3
AND		73	1	1	3	30	0.000000	M	-.12290785E+04	.10000000E+01	.20000000E+01	3	RD	S-V1-V2-V3
AND		73	1	1	3	30	0.000000	P	.86336616E-01	0.	.10000000E+01	2	TDOA	V1V2-SV2
AND		73	1	1	3	30	0.000000	L	.25471297E+09	.30000000E+01	.10000000E+01	2	R	S-V1-V2-V3
AND		73	1	1	3	30	0.000000	F	.17685485E+00	0.	.30000000E+01	2	TDOA	SV1V2-SV2
AND		73	1	1	3	30	0.000000	M	.18664913E+04	.10000000E+01	.30000000E+01	2	RD	S-V1-V2-V3
AND	VTS	73	1	1	3	30	0.000000	R	.25126858E+00	0.	0.	1	3WR	S1V1-S1V2
AND	VTS	73	1	1	3	30	0.000000	R	.32578373E+00	0.	0.	3	3WR	S1V1-S1V2
AND	VTS	73	1	1	3	30	0.000000	R	.22728490E+00	0.	0.	2	3WR	S1V1-S1V2
DUM		73	1	1	3	30	0.000000	J	.76449332E+08	.64094964E+03	.30000000E+01	1	R RD	V1-V2
DUM		73	1	1	3	30	0.000000	S	.20512644E+00	0.	.30000000E+01	1	MULT	V1EV2-V1V2
DUM		73	1	1	3	30	0.000000	N	.19864232E+09	.20000000E+01	.30000000E+01	1	R	V1-V2-V3
DUM		73	1	1	3	30	0.000000	O	-.63612328E+03	.20000000E+01	.30000000E+01	1	RD	V1-V2-V3
DUM		73	1	1	3	30	0.000000	J	.69791027E+08	-.31827148E+03	.20000000E+01	1	R RD	V1-V2
DUM		73	1	1	3	30	0.000000	S	.15522807E+00	0.	.20000000E+01	1	MULT	V1EV2-V1V2
DUM		73	1	1	3	30	0.000000	J	.12219299E+09	-.12770729E+04	.30000000E+01	2	R RD	V1-V2
VTS		73	1	1	3	45	0.000000	I	.12384883E+09	.13667774E+03	.46345725E+02	1	RAE	S-V1
VTS		73	1	1	3	45	0.000000	K	.20088476E+09	.10547731E+04	.30000000E+01	1	R RD	S-V1-V2
VTS		73	1	1	3	45	0.000000	K	.19338727E+09	.15316026E+03	.20000000E+01	1	R RD	S-V1-V2
VTS		73	1	1	3	45	0.000000	M	-.11198670E+04	.30000000E+01	.20000000E+01	1	RD	S-V1-V2-V3
VTS		73	1	1	3	45	0.000000	I	.16019300E+09	.10231545E+03	.68126840E+02	3	RAE	S-V1
VTS		73	1	1	3	45	0.000000	L	.35077638E+09	.10000000E+01	.20000000E+01	3	R	S-V1-V2-V3

VTS		73	1	1	3	45	0.000000	1	.11744971E+09	.11206942E+03	.19751365E+12	2	RAE	S-V1
VTS		73	1	1	3	45	0.000000	M	.30528921E+04	.30000000E+01	.10000000E+01	2	RD	S-V1-V2-V3
VTS		73	1	1	3	45	0.000000	K	.23649465E+09	.13591647E+04	.30000000E+01	2	R RD	S-V1-V2
VTS		73	1	1	3	45	0.000000	L	.31553058E+09	.10000000E+01	.30000000E+01	2	R	S-V1-V2-V3
VTS	AND	73	1	1	3	45	0.000000	Q	-.17546611E-03	0.	0.	1	TDA	VS1-VS2
VTS	AND	73	1	1	3	45	0.000000	Q	-.32384544E-03	0.	0.	3	TDA	VS1-VS2
VTS	AND	73	1	1	3	45	0.000000	Q	.68109566E-02	0.	0.	2	TDA	VS1-VS2
AND		73	1	1	3	45	0.000000	7	.41443551E+03	0.	0.	1	RD	S-V1
AND		73	1	1	3	45	0.000000	L	.31460467E+09	.30000000E+01	.20000000E+01	1	R	S-V1-V2-V3
AND		73	1	1	3	45	0.000000	M	-.12517182E+04	.10000000E+01	.20000000E+01	3	RD	S-V1-V2-V3
AND		73	1	1	3	45	0.000000	F	.84192903E-01	0.	.10000000E+01	2	TDDA	SV1V2-SV2
AND		73	1	1	3	45	0.000000	L	.25732490E+09	.30000000E+01	.10000000E+01	2	R	S-V1-V2-V3
AND		73	1	1	3	45	0.000000	P	.17365905E+00	0.	.30000000E+01	2	TDOA	SV1V2-SV2
AND		73	1	1	3	45	0.000000	M	.19443000E+04	.10000000E+01	.30000000E+01	2	RD	S-V1-V2-V3
AND	VTS	73	1	1	3	45	0.000000	R	.25231033E+00	0.	0.	1	3WR	S1V1-S1V2
AND	VTS	73	1	1	3	45	0.000000	R	.32606112E+00	0.	0.	3	3WR	S1V1-S1V2
AND	VTS	73	1	1	3	45	0.000000	R	.23231241E+00	0.	0.	2	3WR	S1V1-S1V2
DUM		73	1	1	3	45	0.000000	J	.77035928E+08	.66115652E+03	.30000000E+01	1	R RD	V1-V2
DUM		73	1	1	3	45	0.000000	S	.20595634E+00	0.	.30000000E+01	1	MULT	V1EV2-V1V2
DUM		73	1	1	3	45	0.000000	N	.19898087E+09	.20000000E+01	.30000000E+01	1	R	V1-V2-V3
DUM		73	1	1	3	45	0.000000	O	-.61187073E+03	.20000000E+01	.30000000E+01	1	RD	V1-V2-V3
DUM		73	1	1	3	45	0.000000	J	.69538435E+08	-.24045636E+03	.20000000E+01	1	R RD	V1-V2
DUM		73	1	1	3	45	0.000000	S	.15870724E+00	0.	.20000000E+01	1	MULT	V1EV2-V1V2
DUM		73	1	1	3	45	0.000000	J	.12104495E+09	-.12730272E+04	.30000000E+01	2	R RD	V1-V2
VTS		73	1	1	4	0	0.000000	1	.12420012E+09	.13686996E+03	.44320419E+02	1	RAE	S-V1
VTS		73	1	1	4	0	0.000000	K	.20153696E+09	.10595292E+04	.30000000E+01	1	R RD	S-V1-V2
VTS		73	1	1	4	0	0.000000	K	.19356279E+09	.23897568E+03	.20000000E+01	1	R RD	S-V1-V2
VTS		73	1	1	4	0	0.000000	M	-.10229190E+04	.30000000E+01	.20000000E+01	1	RD	S-V1-V2-V3
VTS		73	1	1	4	0	0.000000	1	.16008849E+09	.10376469E+03	.69340220E+02	3	RAE	S-V1
VTS		73	1	1	4	0	0.000000	L	.34935483E+09	.10000000E+01	.20000000E+01	3	R	S-V1-V2-V3
VTS		73	1	1	4	0	0.000000	1	.11981198E+09	.11032978E+03	.21381320E+02	2	RAE	S-V1
VTS		73	1	1	4	0	0.000000	M	.31493094E+04	.30000000E+01	.10000000E+01	2	RD	S-V1-V2-V3
VTS		73	1	1	4	0	0.000000	K	.23971565E+09	.13534423E+04	.30000000E+01	2	R RD	S-V1-V2
VTS		73	1	1	4	0	0.000000	L	.31735248E+09	.10000000E+01	.30000000E+01	2	R	S-V1-V2-V3
VTS	AND	73	1	1	4	0	0.000000	Q	-.19718713E-03	0.	0.	1	TDA	VS1-VS2
VTS	AND	73	1	1	4	0	0.000000	Q	-.62179390E-03	0.	0.	3	TDA	VS1-VS2
VTS	AND	73	1	1	4	0	0.000000	Q	.6[illegible]3807E-02	0.	0.	2	TDA	VS1-VS2
AND		73	1	1	4	0	0.000000	7	.41340363E+03	0.	0.	1	RD	S-V1
AND		73	1	1	4	0	0.000000	L	.31366028E+09	.30000000E+01	.20000000E+01	1	R	S-V1-V2-V3
AND		73	1	1	4	0	0.000000	M	-.12524770E+04	.10000000E+01	.20000000E+01	3	RD	S-V1-V2-V3
AND		73	1	1	4	0	0.000000	P	.82036786E-01	0.	.10000000E+01	2	TDOA	SV1V2-SV2
AND		73	1	1	4	0	0.000000	L	.26036763E+09	.30000000E+01	.10000000E+01	2	R	S-V1-V2-V3
AND		73	1	1	4	0	0.000000	F	.17033413E+00	0.	.30000000E+01	2	TODA	SV1V2-SV2

```
AND       73  1  1  4  0   0.000000  M   .20019679E+04   .10000000E+01   .30000000E+01   2  RD    S-V1-V2-V3
AND  VTS  73  1  1  4  0   0.000000  R   .25274636E+00  0.              0.               1  3WR   S1V1-S1V2
AND  VTS  73  1  1  4  0   0.000000  R   .32614652E+00  0.              0.               3  3WR   S1V1-S1V2
AND  VTS  73  1  1  4  0   0.000000  R   .23677046E+00  0.              0.               2  3WR   S1V1-S1V2
DUM       73  1  1  4  0   0.000000  J   .77636833E+08   .67276291E+03   .30000000E+01   1  R RD    V1-V2
DUM       73  1  1  4  0   0.000000  S   .20496045E+00  0.               .30000000E+01   1  MULT  V1EV2-V1V2
DUM       73  1  1  4  0   0.000000  N   .19754050E+09   .20000000E+01   .30000000E+01   1  R       V1-V2-V3
DUM       73  1  1  4  0   0.000000  O  -.58913181E+03   .20000000E+01   .30000000E+01   1  RD      V1-V2-V3
DUM       73  1  1  4  0   0.000000  J   .69362666E+08  -.14779062E+03   .20000000E+01   1  R RD    V1-V2
DUM       73  1  1  4  0   0.000000  S   .16210166E+00  0.               .20000000E+01   1  MULT  V1EV2-V1V2
DUM       73  1  1  4  0   0.000000  J   .11990367E+09  -.12618947E+04   .30000000E+01   2  R RD    V1-V2

EXIT SEGMENT 61 AT      1.2 SECONDS.  EXECUTION TIME FOR SEGMENT 61 WAS      .5 CP SECS.
```

D. TRACE INPUT FORMS

APPENDIX D

TRACE INPUT FORMS

INTRODUCTION

The engineering specification forms and load sheets that follow are very useful in expediting the preparation of TRACE input. Some of these forms bear former TRACE designations (TRACE-66 and TRACE66), which will be removed when the forms are updated.

TRAJECTORY ANALYSIS AND PROGRAMMING DEPARTMENT

TRACE66 (AD104A) **ENGINEERING REQUEST FORM**

GENERAL INFORMATION:

REQUESTER ______________________ TELEPHONE ________ DATE __________

PROBLEM NUMBER OR J O. ______________________ DUE DATE __________

PROJECT ____

TYPE OF TRACE RUN:

EPHEMERIS GENERATION ( )
ORBIT DETERMINATION ( )
DATA GENERATION ( )
COVARIANCE ANALYSIS ( )

GENERAL INSTRUCTIONS:

IF A RERUN, USE DATA DECK LABELED ______________________

NEW DATA DECK TO BE SAVED: ( ) YES ( ) NO

DISPOSITION (TO BE COMPLETED BY PRODUCTION COORDINATOR)

SET UP BY ______________________ RUN ID __________ DATE __________

TAPE SAVED IF REQUIRED ______________________

JOB DISPOSITION AND RESULTS:

NOTE: ALL SPECIFIED INPUT UNITS MUST BE CONSISTENT.

TIME OF RUN:

CP ______________ PP ______________

DATE JOB COMPLETED ______________

DATA DECK LABELED AS ______________

AEROSPACE FORM 4138 REV 8-71

TRACE 66

ORBIT AND FORCE MODEL SPECIFICATIONS

RUN TITLE: ______________________________

EPOCH:

INITIAL CONDITIONS: INDICATE THE TYPE USED — VALUES

EPOCH		*1	2	*3	*4	*5	*6	*7	*8	VALUES
YEAR	______									______
MONTH	______	x	α	a	λ	ℓ_p	a	a_I	x_{BF}	______
DAY	______	y	δ	e	δ	δ_p	e	a_K	y_{BF}	______
TIME ZONE	______	z	β	i	β	h_p	i	n	z_{BF}	______
HOUR	______	$\dot{x}$	A	Ω	A	h_a	Ω	L	$\dot{x}_{BF}$	______
MINUTE	______	$\dot{y}$	r	ω	r	t_p	ω	χ	$\dot{y}_{BF}$	______
SECOND	______	$\dot{z}$	v	ν	v	Δt	M	Ψ	$\dot{z}_{BF}$	______

NOTE: IF ICTYP IS NEGATIVE, THEN THE UNITS OF THE INITIAL CONDITIONS ARE ASSUMED TO BE INTERNAL.
LUNAR INITIAL CONDITIONS ARE TYPES 11 THROUGH 18, CORRESPONDING TO THE ABOVE EARTH-REFERENCED TYPES 1 THROUGH 8.

GRAVITY MODEL: CHECK ONE.

SPHERICAL ( ) STANDARD 6, 6 ( ) STANDARD 7, 6 ( )
C_2, C_3, C_4 ( ) STANDARD 8, 8 ( ) OTHER (ATTACH) ( )

SUN-MOON ATTRACTIONS: NO ( ) YES ( )

DRAG COEFFICIENT: C_DA/W = ______ FT^2/LB

SEGMENTED DRAG COEFFICIENTS: $(C_DA/W)_1$ = ______

$(C_DA/W)_2$ = ______ t_2 = ______ MME $(C_DA/W)_6$ = ______ t_6 = ______ MME
$(C_DA/W)_3$ = ______ t_3 = ______ MME $(C_DA/W)_7$ = ______ t_7 = ______ MME
$(C_DA/W)_4$ = ______ t_4 = ______ MME $(C_DA/W)_8$ = ______ t_8 = ______ MME
$(C_DA/W)_5$ = ______ t_5 = ______ MME $(C_DA/W)_9$ = ______ t_9 = ______ MME

C_D **TABLES:** INDICATE THE OPTION TO BE USED AND ATTACH TABLES IF ANY

( ) NONE ( ) C_D = f(t) ( ) C_D = f(h)

LINEAR WEIGHT LOSS: NO ( ) YES ( ) W_o = ______ W_{MIN} = ______ LBS
$\dot{W}$ = ______ LBS/MIN t_s = ______ MME t_1 = ______ MME

INSTANTANEOUS WEIGHT CHANGES: NO ( ) YES ( ) ATTACH TABLES

ATMOSPHERE MODEL: CHECK ONE AND PROVIDE INPUTS AS REQUIRED

ARDC 1959 ( ) US STD 1962 ( )

EXPONENTIAL ( ); ρ_o = ______ β = ______ h = ______

SWI ( ); c_1 = ______ c_2 = ______ c_3 = ______
c_4 = ______ c_5 = ______ c_6 = ______
n = ______ i = ______

LOCKHEED-JACCHIA ( ); D1 = ______ D2 = ______ FLUX = ______

EMSC 1967 ( ); $\bar{F}_{10.7}$ = ______ $F_{10.7}$ = ______ k_p = ______

JACCHIA 1964 ( ); $\bar{F}_{10.7}$ = ______ $F_{10.7}$ = ______ a_p = ______

JACCHIA 1964 (MOD) ( ); $\bar{F}_{10.7}$ = ______ $F_{10.7}$ = ______ a_p = ______

CRL ( ); $\bar{F}_{10.7}$ = ______ $F_{10.7}$ = ______ k_c = ______

IF a_p, $F_{10.7}$, k_p, OR k_c ARE TO BE FUNCTIONS OF TIME, ATTACH TABLES

SOLAR RADIATION PRESSURE: NO ( ) YES ( )

A/W = ______ FT^2/LB C_p = ______ LBS/FT^2 C_pA/W ______

ONBOARD ACCELEROMETER: NO ( ) YES ( ), ATTACH TABLES

FINITE THRUSTING: NO ( ) YES ( ), ATTACH TABLES

ORBIT ADJUSTS: NO ( ) YES ( ), ATTACH TABLES

INPUT LENGTH UNITS ARE IN ______ (ft, m, cm, km, er, etc.)

AEROSPACE FORM 6134 REV 9-71

TRACE66

GRAVITY MODEL SPECIFICATION

Check one: No normalization ( )
APL normalization ( )
KAULA normalization ( )

n	m	C_{nm}	S_{nm}	n	m	C_{nm}	S_{nm}

AEROSPACE FORM 4475

TRACE66

ATMOSPHERE AND C_D TABLES

Check one:
( ) a_p = f(t); with a maximum of 50 entries
( ) k_p = f(t); with a maximum of 50 entries
( ) k_c = f(t); with a maximum of 50 entries
( ) $F_{10.7}$ = f(t); with a maximum of 12 entries
( ) C_D = f(t); with a maximum of 25 entries
( ) C_D = f(h); with a maximum of 25 entries

t(MME) or h(ft)	f(t) or f(h)	t(MME) or h(ft)	f(t) or f(h)

AEROSPACE FORM 4480

TRACE66
EVENT SPECIFICATIONS

ONBOARD ACCELEROMETER:

T MME	SCALE FACTOR	BIAS FT/SEC²	T MME	SCALE FACTOR	BIAS FT/SEC²

FINITE THRUSTING:

TYPE	P_1	P_2	P_3	P_4
1	T_1 (FT/SEC^2)	T_2 (1/MIN)	NOT USED	V (± FT/SEC)
2	T/W	C FT/SEC	A/G_0	V (± FT/SEC)
3	A (FT/SEC^2)	α	β	γ
4	A (FT/SEC^2)	θ'_Y (DEG)	θ'_P (DEG)	V (± FT/SEC)
5	A (FT/SEC^2)	θ_Y (DEG)	θ_P (DEG)	V (±FT/SEC)
6	T (LB)	ℓ	m	n
7	T (LB)	θ'_Y (DEG)	θ'_P (DEG)	±V(± FT/SEC)
8	T (LB)	θ_Y (DEG)	θ_P (DEG)	±V(±FT/SEC)

T_S (MME)	T_F (MME)	TYPE	P_1	P_2	P_3	P_4

INSTANTANEOUS WEIGHT CHANGES:

T(MME)	ΔW(LBS)	T(MME)	ΔW(LBS)	T(MME)	ΔW(LBS)

ORBIT ADJUSTS:

T(MME)	TYPE	P_1	P_2	P_3

TYPE	P_1	P_2	P_3
1	$\dot{R}$(FT/SEC)	$\dot{T}$(FT/SEC)	$\dot{C}$(FT/SEC)
2	K (FT/SEC)	θ_Y (DEG)	θ_P (DEG)
3	β (DEG)	A (DEG)	V(FT/SEC)

AEROSPACE FORM 4141 REV 5-71

TRACE-66
PARAMETER SPECIFICATIONS

PARAMETER IDENTIFICATION	P/Q	INITIAL VALUE *	BOUND	STANDARD DEVIATION

* THIS VALUE FIELD IS USED ONLY FOR OBSERVATION BIASES AND SCALE FACTORS.

AEROSPACE FORM 4146

TRACE66

ORBIT DETERMINATION SPECIFICATIONS

ALL PARAMETERS MUST BE SPECIFIED ON THE TRACE66 PARAMETER SPECIFICATION FORM.

OBSERVATIONS ARE TO BE INPUT BY;

( ) CARDS
( ) CARD IMAGE TAPE
( ) BINARY OBSERVATION TAPE

IF CARDS OR A CARD IMAGE TAPE ARE BEING USED AND THE OBSERVATION DATA TO BE USED IS A SUBSET OF THE DATA PROVIDED, THE BEGINNING AND END OF THE INTERVAL TO BE USED ARE GIVEN BY:

BEGINNING YEAR ______ MONTH ______ DAY ______ HOUR ______ MIN ______ SEC ______

END YEAR ______ MONTH ______ DAY ______ HOUR ______ MIN ______ SEC ______

STATION INPUTS: η_E AND η_R ARE THE INDICES OF REFRACTION USED TO COMPUTE REFRACTION CORRECTIONS FOR ELEVATION AND RANGE DATA. A "√" INDICATES THE NOMINAL VALUES ARE TO BE USED, A "O" INDICATES NO CORRECTIONS AND IF A NON-STANDARD INDEX OF REFRACTION IS TO BE USED, IT MUST BE PROVIDED.

STA NAME	LAT (DEG)	LONG (DEG)	HEIGHT (FEET)	INTERFEROMETER P	Q	η_E (312×10^{-6})	η_R (350×10^{-6})

OBSERVATION WEIGHTS (σ's):

STA	DATA TYPE	σ	DATA TYPE	σ	DATA TYPE	σ	DATA TYPE	σ

SUPPLY THE REQUIRED INPUTS FOR THE FOLLOWING IF OTHER THAN NOMINAL.

______ MAXIMUM NUMBER OF ITERATIONS
______ RELATIVE CONVERGENCE TEST (.001)
______ ABSOLUTE CONVERGENCE TEST (0)
______ n FOR n-SIGMA EDITOR (100)

OPTIONS: CHECK THE OPTIONS DESIRED AND SUPPLY THE REQUIRED INPUT

( ) SPEED OF LIGHT CORRECTION
  ( ) POSITIVE CORRECTION
  ( ) NEGATIVE CORRECTION
( ) PRINT OBSERVATION RESIDUALS
( ) PRINT OBSERVATION PARTIAL DERIVATIVES
( ) PRINT ORDERED CORRELATION MATRIX
( ) PRINT CORRELATION MATRIX AFTER LAST ITERATION
( ) SUPPRESS CORRELATION MATRICES
( ) PRINT A^TA AND $(A^TA)^{-1}$ AFTER EACH ITERATION, OR LAST ITERATION ONLY
( ) PUNCH A^TA AFTER LAST ITERATION
( ) PUNCH SOLUTION VECTOR
( ) PRINTER PLOT OF OBSERVATION RESIDUALS AFTER LAST ITERATION
  DATA RATE IS ______ SEC
( ) GENERATE AND SAVE OBSERVATION RESIDUAL TAPE

AEROSPACE FORM 6137 REV 5-71

TRACE-66

TRAJECTORY OUTPUT SPECIFICATIONS

OUTPUT TIMES: TIMES ARE GIVEN AS MINUTES FROM EPOCH ( ) OR MIDNIGHT ( )

FROM	TO	EVERY	MIN
______	______	______	
______	______	______	
______	______	______	
______	______	______	
______	______	______	
______	______	______	
______	______	______	
______	______	______	
______	______	______	

SPECIAL OUTPUT TIMES: (√)

- $\beta = 90$ ( )
- MIN., MAX. ALTITUDE ( )
- SPECIAL LATITUDES ( )
- SPECIAL LONGITUDES ( )
- SPECIAL ALTITUDES ( )
- OBSERVATION TIMES ( )

SPECIAL

LAT.	LONG.	ALT.
______	______	______
______	______	______
______	______	______
______	______	______
______	______	______
______	______	______

OUTPUT REQUESTED: (√)

STANDARD

- a) EVERY TIME ( )
- b) NODES ONLY ( )

ELEMENTS

- a) EVERY TIME ( )
- b) NODES ONLY ( )

GEOMAGNETIC LAT. AND LONG. ( )

SUN-MOON ANGLES

- a) STANDARD ( )
- b) OPTION Y ( )
- c) OPTION Z ( )

ECLIPSING

- a) STANDARD ( )
- b) OPTIONAL ( )

VARIATIONAL EQUATIONS

- a) STANDARD ( )
- b) OPTION B ( )
- c) OPTION C ( )

GROUND TRACK TAPE ( )

DIFFERENCE TAPE ( )

AEROSPACE FORM 4140 REV 6-66

TRACE66

COVARIANCE ANALYSIS SPECIFICATIONS

ALL PARAMETERS MUST BE SPECIFIED ON THE TRACE66 PARAMETER SPECIFICATION FORM.

OBSERVATION GENERATION SPECIFICATIONS MUST BE SUPPLIED ON THE TRACE66 DATA GENERATION SPECIFICATIONS - SHEET 1.

IF OBSERVATIONS ARE TO BE INPUT RATHER THAN GENERATED, INDICATE THE SOURCE

( ) CARDS ( ) CARD IMAGE TAPE ( ) BINARY OBSERVATION TAPE

IF CARDS OR A CARD IMAGE TAPE ARE BEING USED AND THE OBSERVATION DATA TO BE USED IS A SUBSET OF THE DATA PROVIDED, THE BEGINNING AND END OF THE INTERVAL TO BE USED ARE GIVEN BY:

BEGINNING YEAR ________ MONTH ________ DAY ________ HOUR ________ MIN ________ SEC. ________
END YEAR ________ MONTH ________ DAY ________ HOUR ________ MIN. ________ SEC. ________

STATION INPUTS: η_E AND η_R ARE THE INDICES OF REFRACTION USED TO COMPUTE REFRACTION CORRECTIONS FOR ELEVATION AND RANGE DATA. A "√" INDICATES THE NOMINAL VALUES ARE TO BE USED, A "O" INDICATES NO CORRECTIONS, AND IF A NON-STANDARD INDEX IS TO BE USED, IT MUST BE PROVIDED.

STA NAME	LAT (DEG)	LONG (DEG)	HEIGHT (FEET)	INTERFEROMETER P	Q	η_E (312×10^{-6})	η_R (350×10^{-6})

OBSERVATION WEIGHTS (σ's):

STA	DATA TYPE	σ	DATA TYPE	σ	DATA TYPE	σ

OUTPUT TIMES: TIMES ARE GIVEN IN MINUTES FROM EPOCH ( ) OR MIDNIGHT ( )

FROM ________ TO ________ EVERY ________ MIN.

OUTPUT REQUESTED: (√) P Q

	P	Q
$C(P_0) = (A^TA)^{-1}$	( )	( )
CARTESIAN	( )	( )
ORBIT PLANE	( )	( )
SPHERICAL	( )	( )
ELEMENT	( )	( )
PERIOD, A_P, PER	( )	( )
EQUINOCTIAL	( )	( )
MEASUREMENT COVARIANCE	( )	( )
PRINT ∂P ∂Q	( )	
SAVE PLOT TAPE	( )	

IF A "√" IS USED THE ENTIRE COVARIANCE MATRIX WILL BE PRINTED. IF A "D" IS USED, ONLY THE SQUARE ROOT OF THE DIAGONAL WILL BE PRINTED.

INPUT A PRIORI UNCERTAINTIES	P PARAMETER	Q PARAMETER
NO A PRIORI INFORMATION	( )	
A^TA MATRIX GIVEN	( )	( )
$(A^TA)^{-1}$ MATRIX GIVEN	( )	
σ's GIVEN	( )	( )
C(Q) MATRIX GIVEN		( )

AEROSPACE FORM 4136 REV 5-71

TRACE66

DATA GENERATION SPECIFICATION SHEET 1

STATIONS									
SUPPLY VALUES FOR									
Δt (SEC)									
E MIN (DEG)									
E MAX (DEG)									
R MAX (NM)									
START TIME FROM MIDNIGHT OF EPOCH — DAY									
START TIME FROM MIDNIGHT OF EPOCH — HR									
START TIME FROM MIDNIGHT OF EPOCH — MIN									
STOP TIME FROM MIDNIGHT OF EPOCH — DAY									
STOP TIME FROM MIDNIGHT OF EPOCH — HR									
STOP TIME FROM MIDNIGHT OF EPOCH — MIN									
A_1 (DEG)									
A_2 (DEG)									

INDICATE THE REQUESTED DATA WITH A "$\surd$"

RANGE									
AZIMUTH									
ELEVATION									
RANGE RATE									
INTERFEROMETER $\dot{P}$									
INTERFEROMETER $\dot{Q}$									
INTERFEROMETER P									
INTERFEROMETER Q									
AZIMUTH RATE									
ELEVATION RATE									
$\ddot{r}$									
LATITUDE									
LONGITUDE									
SURFACE RANGE									
HEIGHT									
DOPPLER RATE									
LOOK ANGLE									
KAPPA									
ASPECT ANGLES									
ATTENUATION									
$\hat{x}, \hat{y}, \hat{z}$									
TOPOCENTRIC RT. ASC. AND DEC.									
GEOCENTRIC RT. ASC. AND DEC.									
HOUR ANGLE									
u, v									
$\ddot{A}$									
$\ddot{E}$									
TWO-WAY DOPPLER									
ANTENNA X, Y ANGLES									
TRANET DOPPLER									
GEOCEIVER RANGE									
Ranging or Diff(s)									
SGLS RANGE RATE									

AEROSPACE FORM 4130 REV 5-71

TRACE66

SIMULTANEOUS VEHICLE DATA GENERATION II SPECIFICATION SHEET

MEASUREMENT TYPE KEY

SYMBOL	DEFINITION
R	Range
AZ	Azimuth
EL	Elevation
$\dot{R}$	Range rate
Ax, Ay	Antenna angles
V2	Vehicle to vehicle range
V2D	Vehicle to vehicle range rate
S2	Station to vehicle to vehicle range sum
S2D	Station to vehicle to vehicle range rate sum
S3	Station to vehicle to vehicle to vehicle range sum
S3D	Station to vehicle to vehicle to vehicle range rate sum
V3	Vehicle to vehicle to vehicle range sum
V3D	Vehicle to vehicle to vehicle range rate sum
TDOA	Time difference of arrival
TOA	Time of arrival
3WR	Three way range
MP	Multi-path

INDICATE THE DESIRED MEASUREMENTS BY THEIR TYPES AND SUPPLY THE NECESSARY STATIONS AND VEHICLE IDENTIFICATION NUMBERS.

TYPE	STA	STA 2	VEHICLE 1	VEHICLE 2	VEHICLE 3

AEROSPACE FORM 4460

STATION CARDS

1. THE LOCATION FIELDS MUST HAVE A DECIMAL POINT.
2. THE EXPONENT FIELDS ARE OPTIONAL, BUT IF USED MUST BE OF THE FORM $\pm$XX.

PROGRAMMER ______ KEYPUNCHED ______ VERIFIED ______ DATE ______ PAGE ______ OF ______

ST	I	E	R	D	T	FIELD 1	EXP.	FIELD 2	EXP.	FIELD 3	EXP.	P	Q
1 2 3	5	7	9	11	13	15 16 17 18 19 20 21 22 23 24 25 26	27 28 29	31 32 33 34 35 36 37 38 39 40 41 42	43 44 45	47 48 49 50 51 52 53 54 55 56 57 58	59 60 61	64 65 66	68 69 70

AEROSPACE FORM 3062 REV 11-72

TRACE – 66: SENSOR PARAMETER CARDS

1. THE INITIAL VALUE, BOUND AND SIGMA FIELDS MUST HAVE A DECIMAL POINT
2. THE EXPONENT FIELDS ARE OPTIONAL, BUT IF USED MUST BE OF THE FORM ± XX.

PROGRAMMER ____________ KEYPUNCHED ____________ VERIFIED ____________ DATE ____________ PAGE ______ OF ______

ST	PASS	NAME	Q	INITIAL VALUE	EXP	BOUND	EXP	SIGMA	EXP
1 2 3	4 5 6 7	9 10 11 12	14	16 17 18 19 20 21 22 23 24 25 26 27	28 29 30	32 33 34 35 36 37 38 39 40 41 42 43	44 45 46	48 49 50 51 52 53 54 55 56 57 58 59	60 61 62
1 2 3	4 5 6 7	9 10 11 12	14	16 17 18 19 20 21 22 23 24 25 26 27	28 29 30	32 33 34 35 36 37 38 39 40 41 42 43	44 45 46	48 49 50 51 52 53 54 55 56 57 58 59	60 61 62

AEROSPACE FORM 3981 REV 5-67

TRACE66 - VEHICLE INPUT

PROGRAMMER ____________ KEYPUNCHED ____________ VERIFIED ____________ DATE ____________ PAGE ____ OF ____

1	2	7	77
H	1		

	1 27 33	2 28 34	7 33 39
SYMBOL	C	LOCATION	VALUE
1	1	VEHID	
2	1	YEAR	
3	1	MNTH	
4	1	DAY	
5		TZNE	
6		HR	
7		MIN	
8		SEC	
9	1	ICTYP	
10		IC	
11		2	
12		3	
13		4	
14		5	
15		6	
16	1	IDRAG	
17		DRAG	

AEROSPACE FORM 4005 REV 6-71

H1: HEADER TO APPEAR ON OUTPUT

VEHID VEHICLE NUMBER
$0 \le$ VEHID ≤ 9999

YEAR/MNTH/DAY: EPOCH DATE

TZNE/HR/MIN/SEC: EPOCH TIME

ICTYP TYPE OF INITIAL CONDITIONS

1	x,	y,	z,	$\dot{x}$,	$\dot{y}$,	$\dot{z}$
2	α,	δ,	β,	A,	r,	v
3	a,	e,	i,	Ω,	ω,	r
4	λ,	δ,	β,	A,	r,	v
5	ℓ_p,	δ_p,	h_p,	h_a,	i,	zf
6	a,	e,	i,	Ω,	ω,	M
7	a_f,	a_g,	N,	L,	χ,	Ψ
8	x_{BF},	y_{BF},	z_{BF},	$\dot{x}_{BF}$,	$\dot{y}_{BF}$,	$\dot{z}_{BF}$

Negative value of ICTYP indicates that initial conditions are in internal units.

NOTE: Above initial conditions refer to Earth as the central body. If ICTYP = ICTYP + 10 the above initial conditions refer to the Moon as the central body.

IC: INITIAL CONDITION INPUT

IDRAG: ATMOSPHERE MODEL
- 0 ARDC 1959
- 1 LOCKHEED JACCHIA
- 2 JACCHIA 1964
- 3 U. S. STANDARD 1962
- 6 LMSC 1967
- 7 EXPONENTIAL
- 8 CAMBRIDGE RESEARCH LABORATORY
- 9 NWL

DRAG: $C_D A/W$ (FT^2/LB)

TRACE - 66: DATA GENERATION I

1 A DECIMAL POINT MUST BE USED IN ALL FIELDS FLAGGED BY AN *

2 IF THE EXPONENT IS TO BE USED IN THE R_{max} FIELD, IT MUST BE OF THE FORM $\pm$XX

PROGRAMMER ________ KEYPUNCHED ________ VERIFIED ________ DATE ________ PAGE ___ OF ___

ST	ΔT (sec)*	E_{min} (deg)*	E_{max} (deg)*	R_{max} (nm)*	EXP.	START TIME DY	START TIME HR	START TIME MIN *	STOP TIME DY	STOP TIME HR	STOP TIME MIN *	A_1 (deg)*	A_2 (deg)*
1 2 3	5 6 7 8 9 10 11 12	14 15 16 17 18 19	21 22 23 24 25 26	28 29 30 31 32 33	34 35 36	38 39	41 42	44 45 46 47 48 49 50	52 53	55 56	58 59 60 61 62 63 64	66 67 68 69 70 71	73 74 75 76 77 78
1 2 3	5 6 7 8 9 10 11 12	14 15 16 17 18 19	21 22 23 24 25 26	28 29 30 31 32 33	34 35 36	38 39	41 42	44 45 46 47 48 49 50	52 53	55 56	58 59 60 61 62 63 64	66 67 68 69 70 71	73 74 75 76 77 78

AEROSPACE FORM 3918 REV 5 67

DATA GENERATION II

PROGRAMMER ________ KEYPUNCHED ________ VERIFIED ________ DATE ________ PAGE ____ OF ____

1–3	5–7	8–10	11–13	14–16	17–19	20–22	23–25	26–28	29–31	32–34	35–37	38–40	41–43	44–46	47–49	50–52	53–55	56–58	59–61	62–64
ST	RANGE AZIMUTH ELEVATION	RANGE RATE P DOT Q DOT	P Q AZIMUTH RATE	ELEVATION RATE R DOUBLE DOT MUTUAL VISIBILITY	LATITUDE LONGITUDE SURFACE RANGE	HEIGHT DOPPLER RATE LOOK ANGLE	OBSERVATION VARIANCES KAPPA ASPECT ANGLES	ATTENUATION $\dot{X}, \dot{Y}, \dot{Z}$ TOPOCENTRIC RA, D	GEOCENTRIC RA, D HOUR ANGLE U, V	ACCELEROMETER A DOUBLE DOT E DOUBLE DOT	2 WAY DOPPLER ANTENNA	TRANET GEOCEIVER SGLS	SAT-TRACKER DOPPLER TIME OF ARRIVAL							

AEROSPACE FORM 3979 REV 12-72

TRACE 66
SIMULTANEOUS VEHICLE
DATA GENERATION II CARDS

PROGRAMMER ______ KEYPUNCHED ______ VERIFIED ______ DATE ______ PAGE ______ OF ______

S T A	1 2 3
T	5
O:O:O 1:2:3	6 7 8
V 1	9 10 11 12
V 2	13 14 15 16
V 3	17 18 19 20
S T A 2	21 22 23
T	24
O:O:O 1:2:3	25 26 27
V 1	28 29 30 31
V 2	32 33 34 35
V 3	36 37 38 39
S T A 2	40 41 42
T	43
O:O:O 1:2:3	44 45 46
V 1	47 48 49 50
V 2	51 52 53 54
V 3	55 56 57 58
S T A 2	59 60 61
T	62
O:O:O 1:2:3	63 64 65
V 1	66 67 68 69
V 2	70 71 72 73
V 3	74 75 76 77
S T A 2	78 79 80

AEROSPACE FORM 4454 REV 6-71

TRACE 66 – SIMULTANEOUS VEHICLE STAGE INPUT

1. A DECIMAL POINT MUST BE USED IN ALL FIELDS FLAGGED BY AN *.

PROGRAMMER ____________ KEYPUNCHED ____________ VERIFIED ____________ DATE ____________ PAGE ______ OF ______

					T BEGIN						T END						T UPDATE						
	M	N*	ΔT*	D	YR	MO	DY	HR	MN	SEC*	YR	MO	DY	HR	MN	SEC*	YR	MO	DY	HR	MN	SEC*	
1 2 3	4	6 7 8 9	11 12 13 14 15 16 17	19	21 22	23 24	25 26	27 28	29 30	31 32 33 34 35 36 37 38	40 41	42 43	44 45	46 47	48 49	50 51 52 53 54 55 56 57	59 60	61 62	63 64	65 66	67 68	69 70 71 72 73 74 75 76	77 78 79 80
1 2 3	4	6 7 8 9	11 12 13 14 15 16 17	19	21 22	23 24	25 26	27 28	29 30	31 32 33 34 35 36 37 38	40 41	42 43	44 45	46 47	48 49	50 51 52 53 54 55 56 57	59 60	61 62	63 64	65 66	67 68	69 70 71 72 73 74 75 76	77 78 79 80

AEROSPACE FORM 4464 REV 10-71

TRACE66 **OBSERVATION DATA**

1. A DECIMAL POINT MUST BE USED IN ALL FIELDS FLAGGED BY AN *.
2. THE EXPONENT FIELDS ARE OPTIONAL, BUT IF USED, MUST BE OF THE FORM ± XX.

PROGRAMMER ____________ KEYPUNCHED ____________ VERIFIED ____________ DATE ____________ PAGE ______ OF ______

ST	PASS	YR	MO	DAY	HR	MIN	SECONDS *	C	T	NRA	OBSERVATION 1 *	EXP	OBSERVATION 2 *	EXP	OBSERVATION 3 *	EXP	VEH #
1 2 3	4 5 6 7	9 10	11 12	13 14	15 16	17 18	19 20 21 22 23 24 25 26	27	28	29 30	31 32 33 34 35 36 37 38 39 40 41 42	43 44 45	46 47 48 49 50 51 52 53 54 55 56 57	58 59 60	61 62 63 64 65 66 67 68 69 70 71 72	73 74 75	77 78 79 80

AEROSPACE FORM 3[illegible] REV 8-71